Questa Waste Rock Investigation
Waste Pile Instrumentation
As-Built Report

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Consulting Engineers and Scientists

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Waste Pile Instrumentation
As-Built Report

SRK Project Number 09215

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September, 1999
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1.0 Introduction

This report describes the field drilling and installation program and presents as-built details for instrumentation installed at the Questa Mine as part of the waste rock investigation. A series of nine drill holes was completed in the waste rock piles at Questa between between July 29 and August 5, 1999. During drilling, geology was logged and continuous sample collection was undertaken. Upon reaching the foundation of the waste piles, instrumentation was installed to enable monitoring of internal temperature and the oxygen concentration, carbon dioxide concentration and humidity in waste rock pile pore gas.

This report contains detailed descriptions of the field drilling procedures, sample collection and handling, placement of the instrumentation and drill hole backfilling. Data from intial paste pH, paste conductivity and moisture content testing of drill holes samples is also presented.

2.0 Drilling and Sample Collection

2.1 Drilling Locations

Appendix A contains a site map that shows the locations of each of the drill holes completed for the waste rock investigation.

2.2 Drilling

Drilling was completed with an AP-1000 hammer drill supplied by Layne Western Drilling Company. The AP-1000 rig was formerly known as a Bekker Rig. The rig was equipped with a 6-inch inner diameter by 9-inch outer diameter casing. The casing was advanced by a top mounted diesel hammer. During drilling, air is pumped downward to the cutting head through the annulus between the inner and outer casings. Drill cuttings are returned to the surface by way of the inner 6-inch opening and are routed through a cyclone to dissipate kinetic energy.

Continuous sample collection was undertaken during drilling. At the end of each 5-foot drilling interval, multiple surges of compressed air were passed through the casing to remove all loose material from the drill hole and minimize cross contamination of samples.

Each sample was examined and lithology, mineralization, gradation, moisture and other pertinent data were recorded on field drilling logs. Original logs were given to Molycorp for filing. Field logs are reproduced in Appendix B.

2.2 Sample Collection and Handling

Initially, cuttings from 0 to 65 feet in drill hole WRD- 4 (the first drilling location) were collected by directing a portion of the cyclone discharge into a plastic bucket. Upon completion of each 5-foot interval, the samples were split to reduce sample weight to between 4 to 10 pounds. These samples were split by poring the sample over the edge of a second plastic bucket, allowing one half of the sample to be retained in the second bucket and one half of the sample to be discarded. Upon completion of sample weight reduction, the split samples were placed in a sealed plastic bags, labeled and transported to a designated indoor storage area.

Beginning at a depth of 70 feet in WRD-4 and for the remainder of drilling program, the sample collection procedure was modified as follows:

- A riffle splitter with 4-inch openings was placed under the cyclone outlet.
- All cuttings from each 5-foot interval were passed through the riffle splitter, and one half of all cuttings from each interval was retained in the sample collection trays.
- If the volume of the cuttings exceeded the capacity of the collection trays, the cuttings were temporarily placed in a plastic bucket.
- Upon completion of each interval, the entire volume of retained cuttings, including off-loaded quantities, was pored through the splitter to reduce sample size.

Upon reduction of the sample weight to between approximately 4 and 10 pounds, the samples were placed in sealed plastic bags, labeled and transported to the designated indoor storage area.

Samples were transferred to the Reagent Room in the mill complex. At the end of each day, the samples were placed in clean 55 gallon drums or plastic buckets with protective lids. The contents of each sample storage drum were clearly labeled.

All drill hole samples were subjected to moisture content, paste pH and paste conductivity testing. Testing was completed in accordance with standard operating procedures on file at Molycorp. Test results are shown on the drilling logs.

3.0 Drill Hole Completion

3.1 Casing Installation

Drill holes were completed with 1-inch diameter, Schedule 40 PVC casing with slip joint couplings. The casing provides two functions:

- It supports instrumentation attached to the outside of the casing; and
- A hand-slotted interval on the lower-most 10 feet of each casing was provided to allow collection of water samples if water was encountered.

The installation of casing in each drill hole is illustrated in Figure 3.1. Upon completion of drilling, casing with pre-attached wire and tubing bundles was hand-lowered into each drill hole. Drill holes were then backfilled to within 30 feet of the ground surface with 10 by 20 silica sand concurrently with the removal of the drill stem. The sand was pored down the inner drill stem annulus as the casing was jacked out of the ground.

From a depth of approximately 30 feet to the ground surface, drill holes were backfilled with drill cuttings. Large rock fragments were removed from the cuttings during backfilling.

Upon completion of casing installation, all drill holes were tested for the presence of water. All holes were dry.

3.2 Instrumentation

Instrumentation consists of thermistor strings and gas sampling tubes. Figures 3.2 through 3.11 illustrate the placement of the sampling tubes and thermistors. Monitoring forms, which detail the locations of all thermistors and gas sampling ports, are contained in Appendix E.

3.2.1 Pore Gas Sampling

Pore gas sampling tubes consist of 0.25-inch O.D. by 0.17-inch I.D. polyethylene tubes that are taped to the outside of the PVC casing. Sampling ports consist of an open tube covered with fabric mesh to prevent clogging as shown in Figure 3.2. Tubing and fabric covers are taped to the outside of the PVC casing. Sample ports are located as shown on Figures 3.3 through 3.11.

Pore gas sampling will be completed with a Nova Analytical Systems Inc. (Nova) Model 309BCWP portable O2 and CO2 Analyzer. Appendix C contains the operating manual for the Nova Analyzer. To extract gas from the interior of the waste rock piles, the Nova Analyzer is connected to the sampling tubes via either a brass union or plastic quick-release union.

3.2.2 Temperature Measurement

Thermistor strings consist of a series stainless steel jacketed thermistors linked to a pre-wired, weather proof surface terminal through a heavy duty PVC coated multi-pair cable. Thermistors cables were assembled and calibrated prior to shipment to the site. The manufacturer's thermistor calibration data is contained in Appendix D.

The thermistors are connected to weather proof 10-channel surface terminals mounted on a steel support frame at the surface of each drill hole. Terminal channels and the corresponding thermistors are arranged as shown on Figures 3.3 through 3.11.
Temperature measurements are performed with an Omega Engineering Model 865F, 2252 ohm digital thermometer. The thermometer was pre-calibrated by the manufacturer.

PROJECT NO **02915** LAST UPDATED **8-30-99** ENGINEER: **E. MULLER**

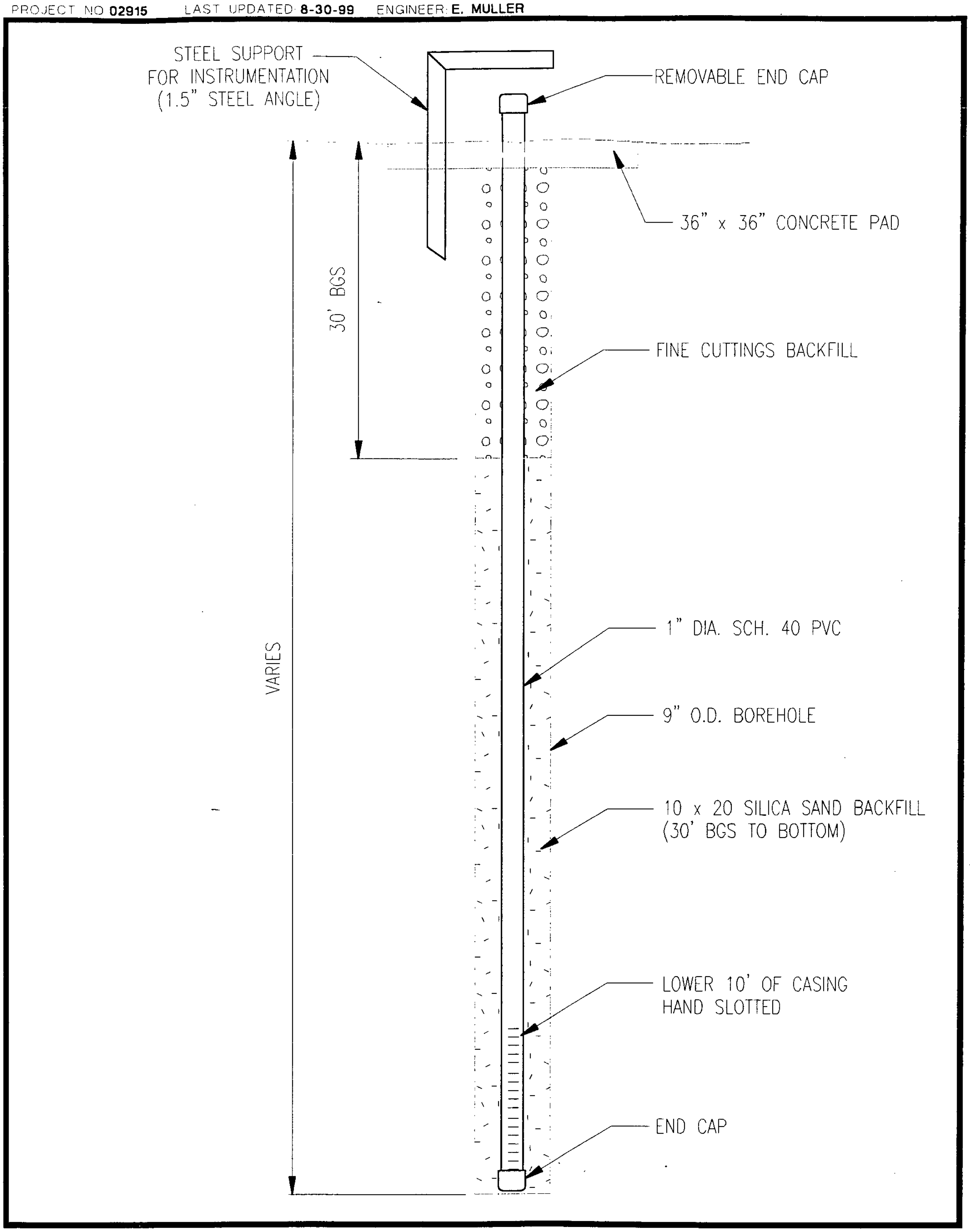

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FIGURE NO. 3.1

QUESTA WASTE ROCK INVESTIGATION
TYPICAL WELL
DETAIL

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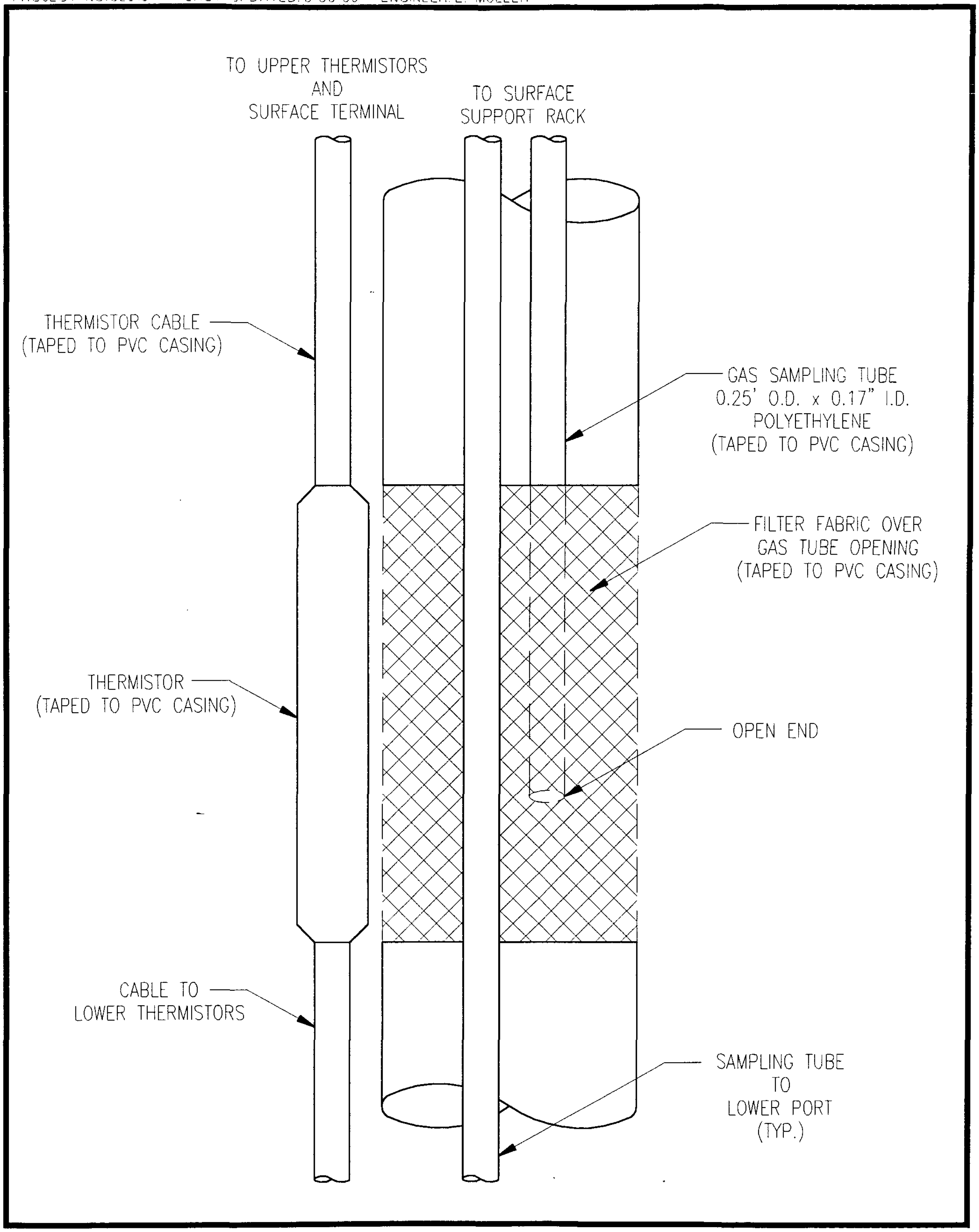

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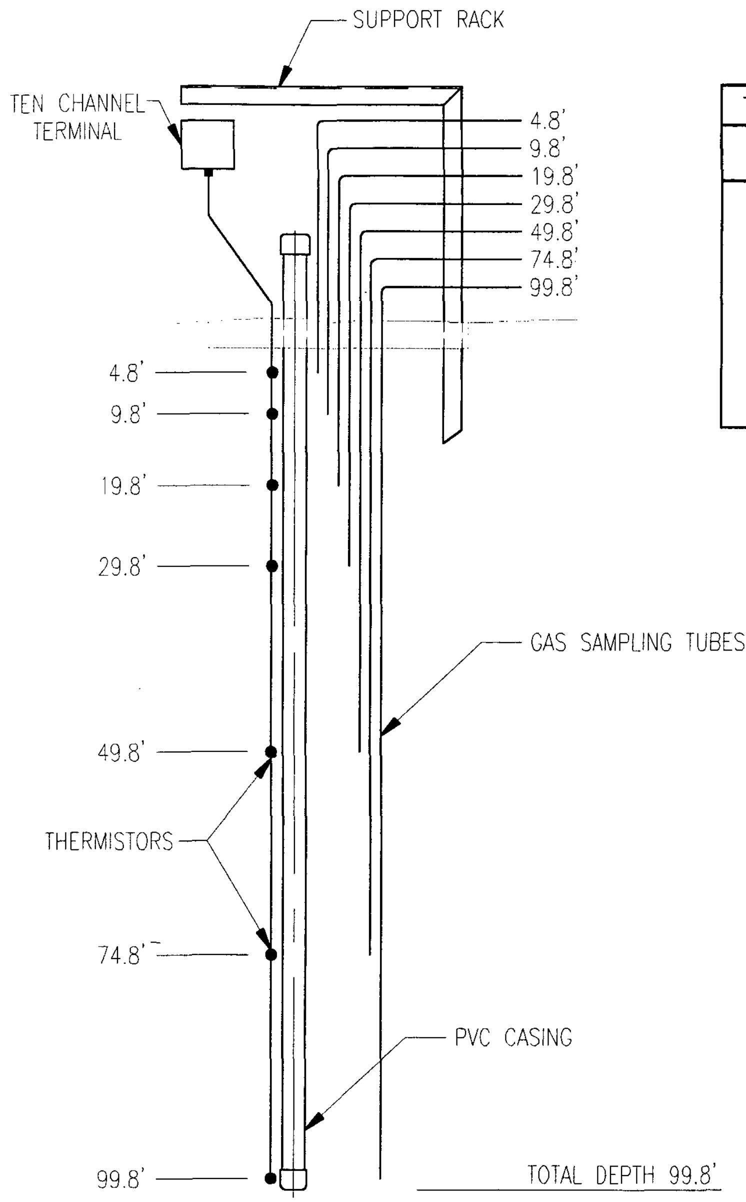
FIGURE NO. 3.2

QUESTA WASTE ROCK INVESTIGATION
TYPICAL SAMPLE POINT
INSTALLATION DETAILS

PROJECT NO 02915   LAST UPDATED 8-30-99   ENGINEER E MULLER



THERMISTOR IDENTIFICATION	
CHANNEL	THERMISTOR DEPTH
1	4.8'
2	9.8'
3	19.8'
4	29.8'
5	49.8'
6	74.8'
7	99.8'

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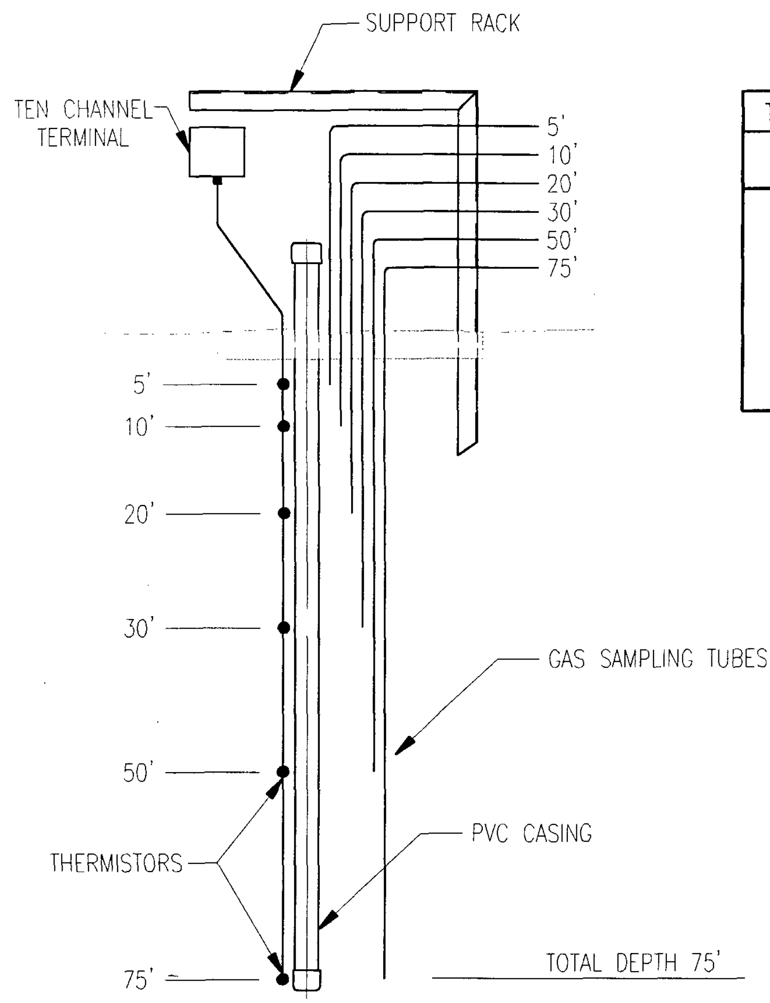
FIGURE NO. 3.3

QUESTA WASTE ROCK INVESTIGATION THERMISTOR AND GAS SAMPLE PORT LOCATIONS - DRILL HOLE WRD 1



THERMISTOR IDENTIFICATION	
CHANNEL	THERMISTOR DEPTH
1	5'
2	10'
3	20'
4	30'
5	50'
6	75'

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FIGURE NO. 3.4

QUESTA WASTE ROCK INVESTIGATION THERMISTOR AND GAS SAMPLE PORT LOCATIONS - DRILL HOLE WRD - 2

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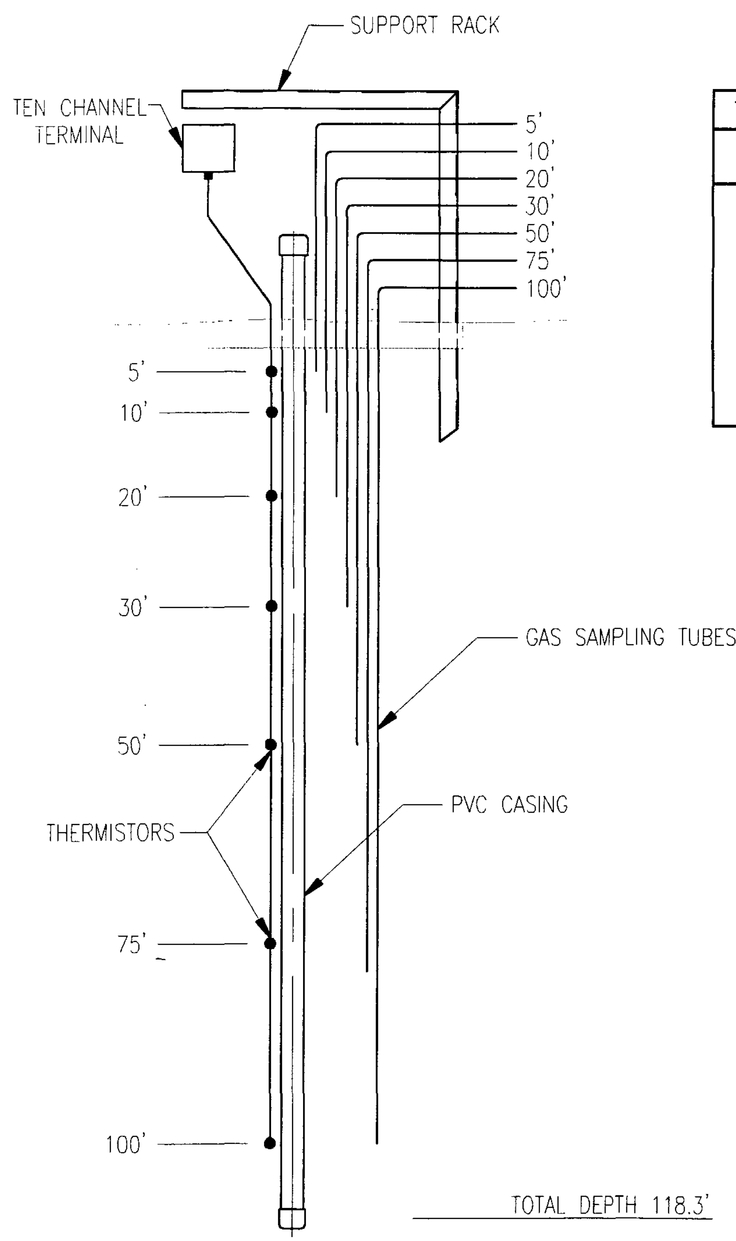

THERMISTOR IDENTIFICATION	
CHANNEL	THERMISTOR DEPTH
1	5'
2	10'
3	20'
4	30'
5	50'
6	75'
7	100'

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FIGURE NO. 3.5

QUESTA WASTE ROCK INVESTIGATION THERMISTOR AND GAS SAMPLE PORT LOCATIONS - DRILL HOLE WRD 3

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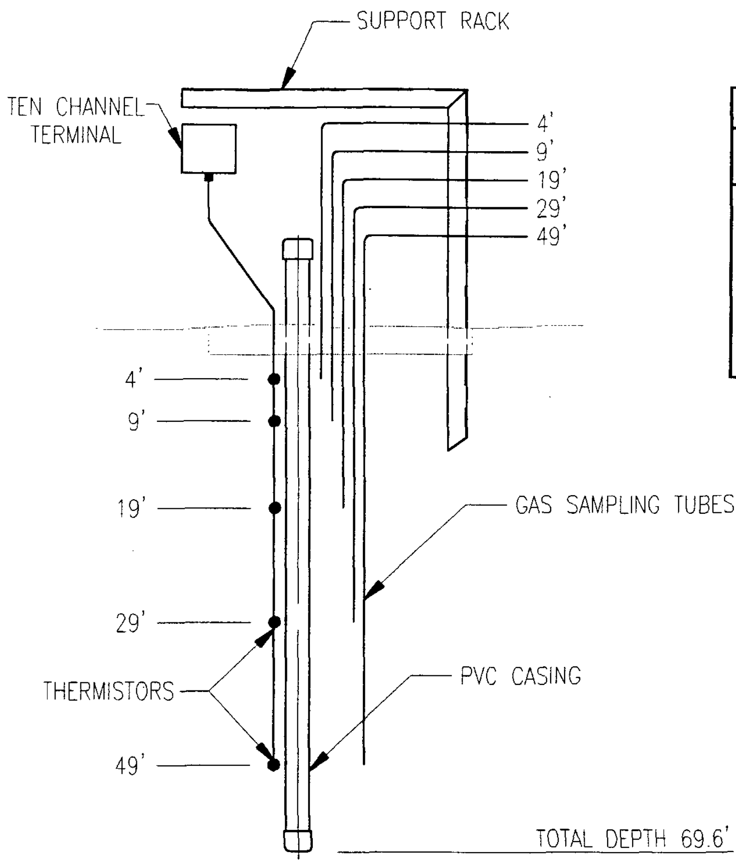

THERMISTOR IDENTIFICATION	
CHANNEL	THERMISTOR DEPTH
1	4'
2	9'
3	19'
4	29'
5	49'

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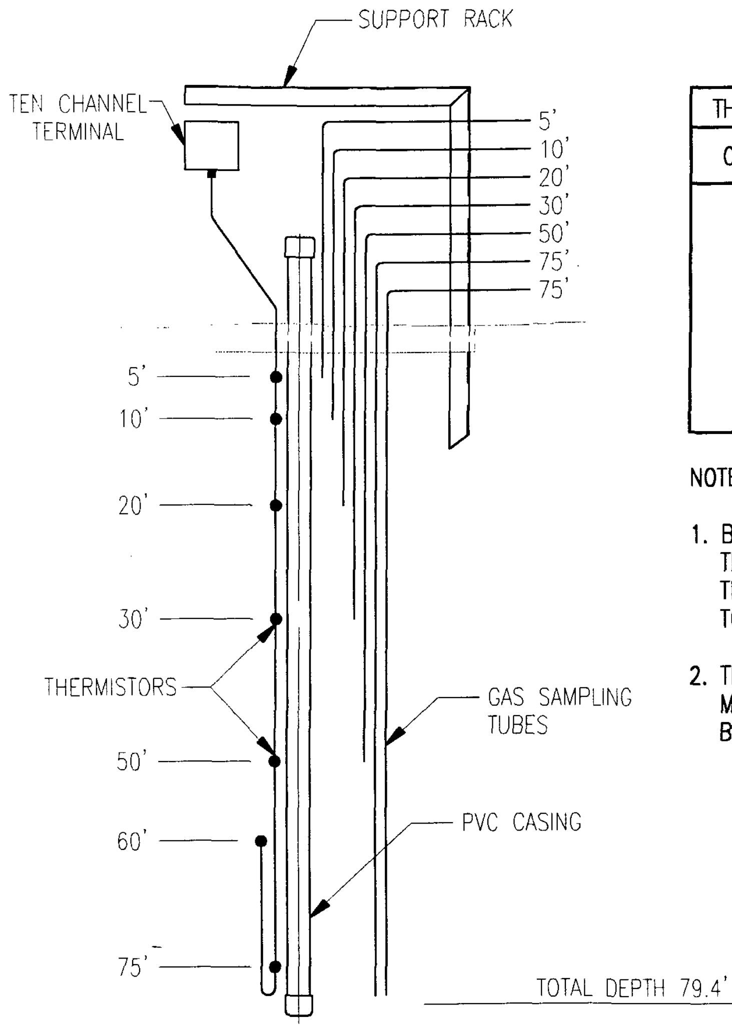
FIGURE NO. 3.6

QUESTA WASTE ROCK INVESTIGATION
THERMISTOR AND GAS SAMPLE
PORT LOCATIONS - DRILL HOLE WRD 4



THERMISTOR IDENTIFICATION	
CHANNEL	THERMISTOR DEPTH
1	5'
2	10'
3	20'
4	30'
5	50'
6	60'
7	75'

NOTES:

1. BEDROCK CONTACT AT LESS THAN ANTICIPATED DEPTH. THERMISTOR AT 100' RELOCATED TO 60' BGS.
2. THERMISTOR WIRING SEQUENCE MODIFIED TO READ SEQUENTIALLY BY DEPTH.

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FIGURE NO. 3.7

QUESTA WASTE ROCK INVESTIGATION THERMISTOR AND GAS SAMPLE PORT LOCATIONS - DRILL HOLE WRD 5

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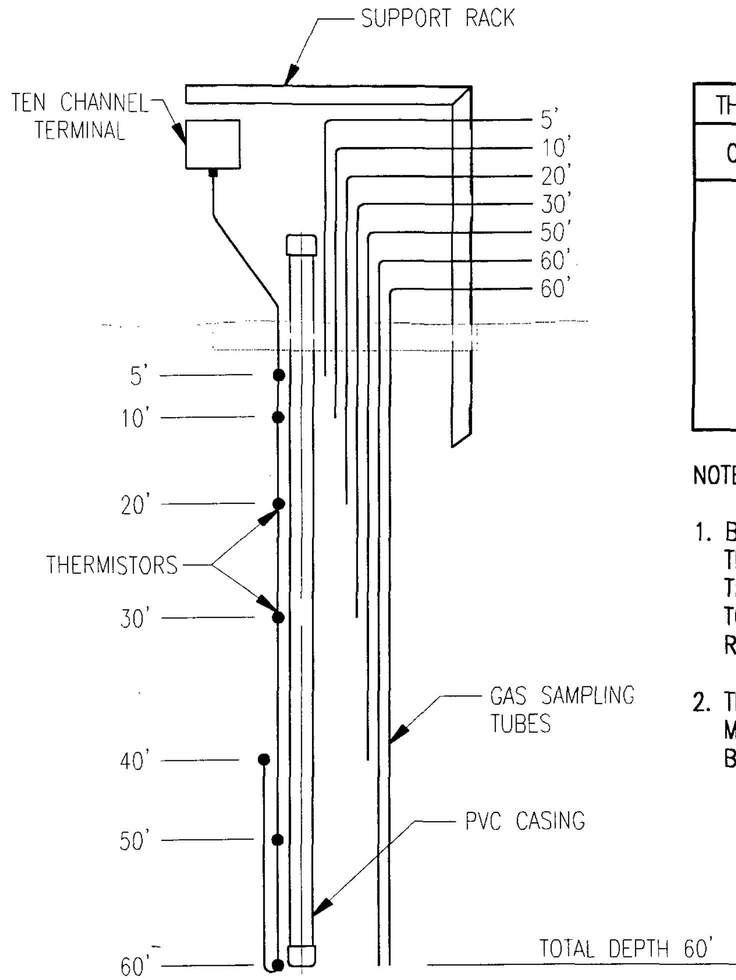

THERMISTOR IDENTIFICATION	
CHANNEL	THERMISTOR DEPTH
1	5'
2	10'
3	20'
4	30'
5	40'
6	50'
7	60'

NOTES:

1. BEDROCK CONTACT AT LESS THAN ANTICIPATED DEPTH. THERMISTOR AT 75' RELOCATED TO 60' BGS. THERMISTOR AT 100' RELOCATED TO 40' BGS.
2. THERMISTOR WIRING SEQUENCE MODIFIED TO READ SEQUENTIALLY BY DEPTH.

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FIGURE NO. 3.8

QUESTA WASTE ROCK INVESTIGATION THERMISTOR AND GAS SAMPLE PORT LOCATIONS - DRILL HOLE WRD 6

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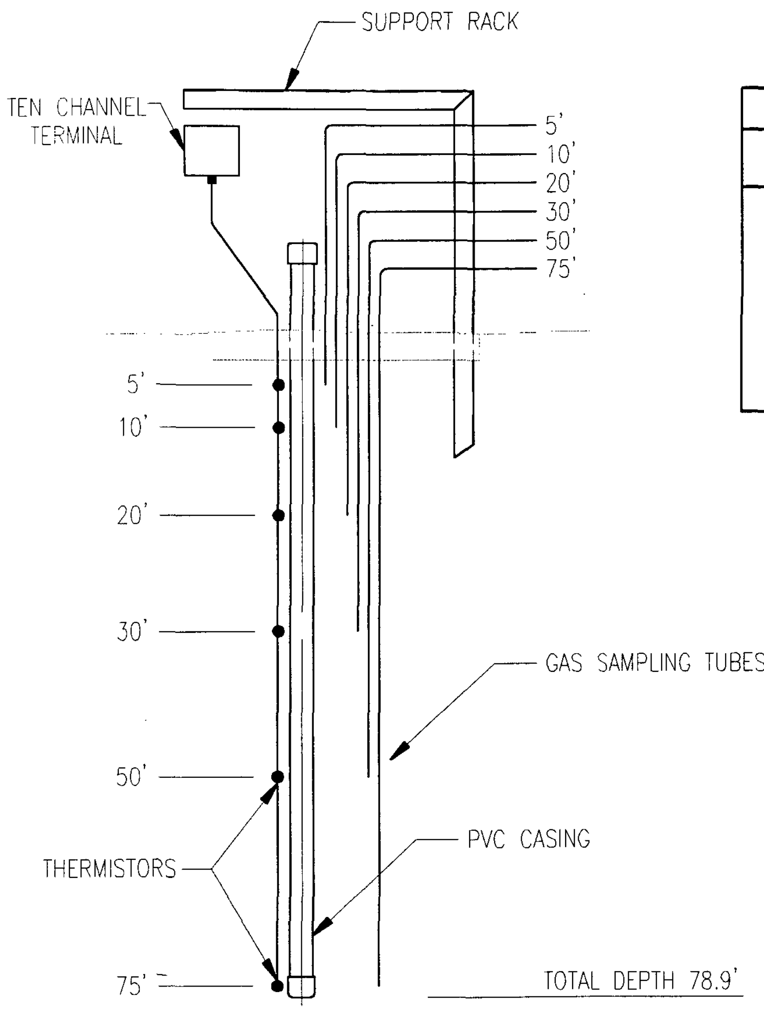

THERMISTOR IDENTIFICATION	
CHANNEL	THERMISTOR DEPTH
1	5'
2	10'
3	20'
4	30'
5	50'
6	75'

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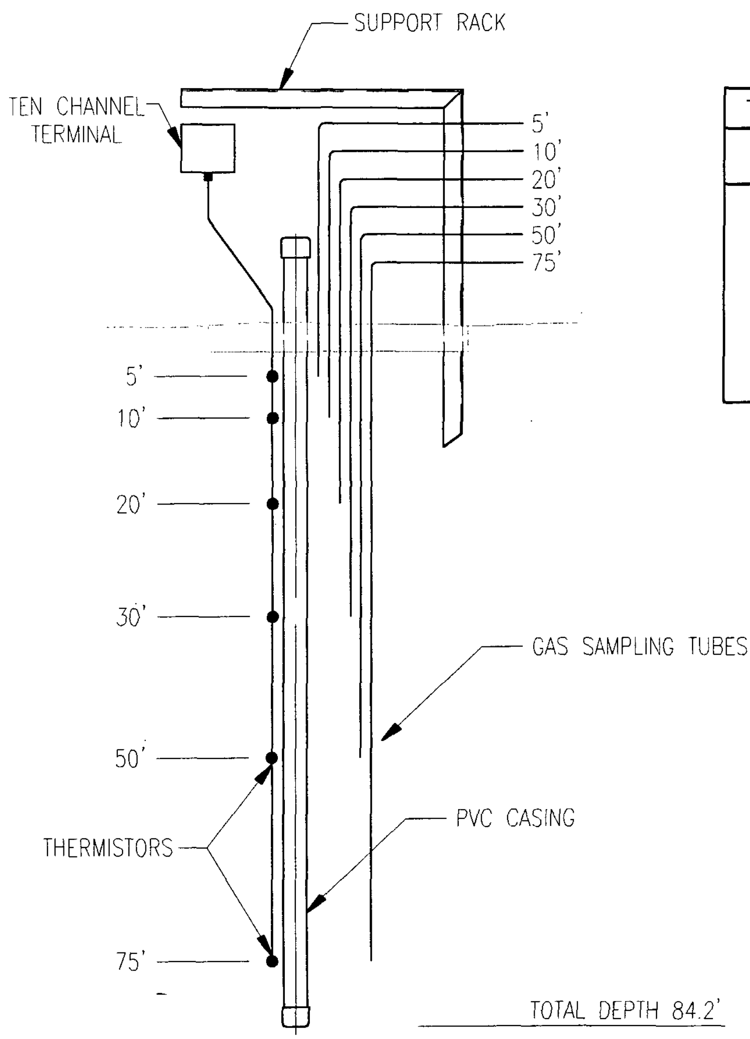
FIGURE NO. 3.9

QUESTA WASTE ROCK INVESTIGATION THERMISTOR AND GAS SAMPLE PORT LOCATIONS - DRILL HOLE WRD 7



THERMISTOR IDENTIFICATION	
CHANNEL	THERMISTOR DEPTH
1	5'
2	10'
3	20'
4	30'
5	50'
6	75'

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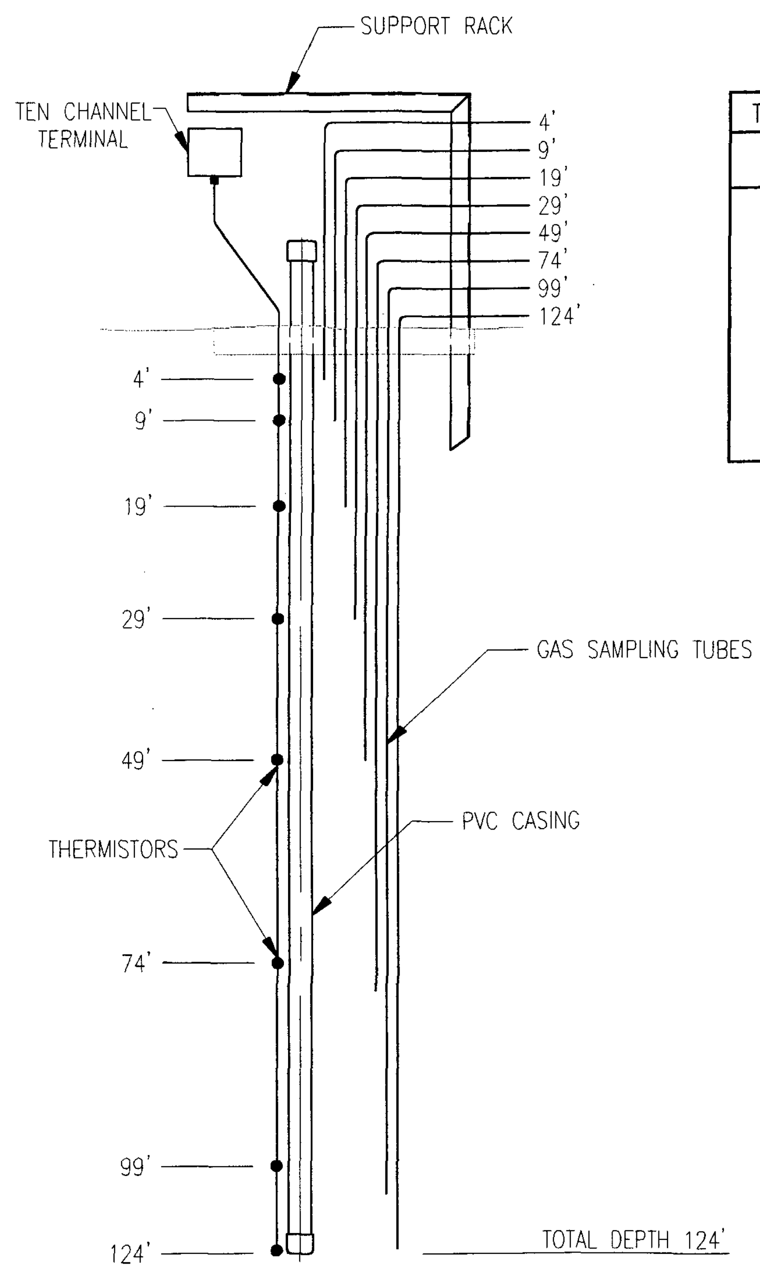
FIGURE NO. 3.10

QUESTA WASTE ROCK INVESTIGATION THERMISTOR AND GAS SAMPLE PORT LOCATIONS - DRILL HOLE WRD 8

PROJECT NO. 02915 LAST UPDATED 8-30-99 ENGINEER: E. MULLER



THERMISTOR IDENTIFICATION	
CHANNEL	THERMISTOR DEPTH
1	4'
2	9'
3	19'
4	29'
5	49'
6	74'
7	99'
8	124'

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FIGURE NO. 3.11

QUESTA WASTE ROCK INVESTIGATION
THERMISTOR AND GAS SAMPLE
PORT LOCATIONS - DRILL HOLE WRD 9

Appendix A

Drill Hole Location Plan

Appendix B

Drilling Logs

Drill Hole: WRD 1	Driller: Layne Western Drilling
	Equipment: AP-1000 Hammer Drill
Start Date 7/31/99	
End Date 7/31/99	Logged By: A. Eschenbacher, SMA
	G. Muller, SRK Consulting Inc.

Depth From	To	Lithology	Comments	Paste pH (su)	Paste Cond (µS)	Moisture Content (%)
0	5	Aplite, light grey, minor pyrite, tan matrix	dry	8.37	634	5.1
5	10	Aplite, with minor andestite, minor pyrite, tan matrix	dry	7.98	1,040	1.6
10	15	Aplite, trace pyrite, tan matrix	dry, poor recovery	7.93	1,380	4.0
15	20	Aplite, light grey, with minor andesite, light grey, tan matrix	dry	7.67	1,850	4.8
20	25	Aplite, light grey, tan matrix	dry	7.93	1,730	4.4
25	30	Andesite, mineralized, strong pyrite, trace molydenite, mineralized, brown matrix	dry,color change to brown at ~27'	7.29	2,400	4.9
30	35	Andesite with aplite and minor rhyolite, strong pyrite, fluorite, calcite, trace molydenite	dry	7.66	2,040	4.1
35	40	Andesite, with minor aplite, trace pyrite, calcite, dark brown matrix	dry	7.73	2,200	6.2
40	45	Andesite, fresh, dark grey to black, calcite, dark brown matrix	dry	7.68	1,750	5.0
45	50	Andesite, dark gret with trace chalcopyrite, abundant calcite, dark brown matrix	dry	7.84	2,340	6.2
50	55	Andesite, dark grey with trace pyrite and calcite, dark brown matrix	dry	7.76	2,250	4.3
55	60	Andesite porphyry, dark grey, strong pyrite, minor calcite, dark brown matrix	dry	7.88	1,800	4.3
60	65	Andesite, dark green-grey, propylitic alteration, abundant calcite, dark brown matrix	dry	8.11	2,070	4.7
65	70	Andesite, dark grey with trace pyrite, abundant calcite, dark brown-grey matrix		7.89	1,630	4.0
70	75	Andesite, fresh, dark grey, with trace pyrite, dark grey-brown matrix	dry	7.98	1,852	3.5
75	80	Andesite,dark grey green with trace pyrite and minor Calcite, dark grey matrix	dry	7.46	1,650	2.5
80	85	Andesite,black, minor calcite, minor propylitic alteration, grey matrix	dry	8.16	1,065	2.4
85	90	Andesite, black, trace calcite, minor propylitic alteration, grey matrix	dry	8.16	1,296	1.6
90	95	Andesite, black, fresh, grey matrix	dry	8.41	836	1.3
95	100	Andesite, black, large blocks, fresh	dry	7.89	2,290	3.8

Questa Waste Rock Investigation							Physical Properties Log
		Drill Hole:	WRD-1				
		Logged By	GM				
		Date	9/16/99				
Interval		Max Particle	Gravel	Sand	Silt and Clay		
From	To	(inches)	(%)	(%)	(%)	Comments	
0	5	1	60	20	20	Coarse gravel in fresh matrix, little weathering, durable	
5	10	4	80	20		Very coarse gravel with +/- 20% sand and silt/caly	
10	15	1.5-2	50	30	20	Increasing fines, fines NP	
15	20	2-3	60	30	10	Coarse gravel	
20	25	2..5-3	60	30	10	Similar to above, slightly coarser	
25	30	3	50-60	30	+/-10	Coarse gravel with sand, durable, little weathering	
30	35	2-2.5	50-60	+/-30	+/-10	Med coarse gravel with sand, NP fines	
35	40					As above	
40	45					As above	
45	50	1.5-2	60	25	+/- 15	Slightly finer, mostly fine, durable gravel with slightly plastic fines	
50	55	1.5	70	20	+/- 10	Mostly med gravel, fresh, dark with little weathering, durable	
55	60	1-1.5	60-70	20-30	+/- 10	Mostly 1/4 to 1" gravel, little weathering, durable	
60	65	1.5-2				As above	
65	70	1.5-2				As above	
70	75	3				As above	
75	80	1-1.5	50-60	+/-30	+/- 10	Med coarse gravel, fresh and unweathered	
80	85					As above	
85	90					As above	
90	95	1..5-2	70	20	+/- 10	Similar to above, coarser	
95	100	2	70	20	+/- 10	Mostly 1" gravel, fresh and durable	

Drill Hole: WRD 2		Driller: Layne Western Drilling				
		Equipment: AP-1000 Hammer Drill				
Start Date 7/31/99						
End Date 7/31/99		Logged By: A. Eschenbacher, SMA				
		G. Muller, SRK Consulting Inc.				
Depth		Lithology	Comments	Paste pH	Paste Cond	Moisture Content
From	To			(su)	(µS)	(%)
0	5	Mixed volcanics, mostly oxidized, yellow-brown clay rich matrix	dry	4.99	1,410	5.7
5	10	Mixed volcanics, trace pyrite, oxidized, yellow-brown clay rich matrix	dry	4.02	2,670	5.6
10	15	Mixed volcanics, oxidized, yellow-brown clay rich matrix	dry	3.53	2,780	8.8
15	20	Mixed volcanics, trace pyrite, oxidized, yellow-brown clay rich matrix	dry	3.17	3,820	6.9
20	25	Mixed volcanics, yellow-brown clay rich matrix	dry	3.66	4,110	8.3
25	30	Mixed volcanics, yellow-brown clay rich matrix	dry	3.38	3,140	10.7
30	35	Mixed volcanics, oxidized, yellow-brown clay rich matrix	dry	3.21	3,190	10.2
35	40	Mixed volcanics, trace pyrite, oxidized, yellow-brown matrix	moist	3.34	2,840	9.3
40	45	Mixed volcanics, trace pyrite, oxidized, yellow-brown clay rich matrix	moist	3.22	3,730	9.6
45	50	mixed volcanics, trace Pyrite, oxidized, yellow-brown clay rich matrix	moist	3.14	5,240	5.7
50	55	Mixed volcanics, trace pyrite, yellow-brown clay rich matrix	moist	3.17	6,440	6.3
55	60	Mixed volcanics, yellow-brown clay rich matrix	moist	3.28	6,370	5.6
60	65	Aplite, trace pyrite, fresh blocks	dry	3.82	5,630	2.3
65	70	Aplite, trace pyrite, fresh blocks	dry, poor recovery	3.66	5,390	3.5
70	75	Aplite, strong pyrite, fresh blocks	dry	4.15	4,220	2.0

Questa Waste Rock Investigation							Physical Properties Log
		Drill Hole:	WRD-2				
		Logged By	GM				
		Date	9/16/99				
Interval From	To	Max Particle (inches)	Gravel (%)	Sand (%)	Silt and Clay (%)		Comments
0	5	1	40-50	20-30	>20		Mostly fine gravel with weathered plastic fines
5	10						As above
10	15						As above
15	20	1.5	50-60				Slightly coarser, mostly - 3/4" gravel
20	25	3/4-1	30-40	+/- 40	+/- 30		Finer, mostly -3/8 " gravel and sand with plastic fines
25	30						As above
30	35						As above
35	40	1.5	30-40	+/- 40	+/- 30		As above, more coarse fragments
40	45	1					As above
45	50	1.5-2	40-50	20-30	+/- 20		Slightly larger gravel fragments, plastic fines
50	55	1.5					As above
55	60	1					As above
60	65	3.5-4	80	15	5		Mostly very coarse and durable, fresh and unweathered
65	70	3x5	60-70	20	10		Mostly 0.25 to 1" gravel

Drill Hole: WRD 3
Driller: Layne Western Drilling
Equipment: AP-1000 Hammer Drill
Start Date 7/30/99
End Date
Logged By: A. Eschenbacher, SMA
G. Muller, SRK Consulting Inc.

Depth From	Depth To	Lithology	Comments	Paste pH (su)	Paste Cond (μS)	Moisture Content (%)
0	5	Andesite, minor aplite, trace pyrite, gravel in tan sand, silt size matrix	dry, split sample	6.07	2,430	2.6
5	10	Aplite, minor andesite, fresh blocks	dry, split sample	8.02	948	0.4
10	15	Andesite fresh with minor aplite, large fragments, trace pyrite	dry, split sample, poor recovery	8.16	2,280	1.3
15	20	Andesite, fresh, trace pyrite, blocks	dry, split sample, poor recovery	8.25	2,190	0.8
20	25	Andesite, fresh, trace pyrite, blocks	dry, split sample	8.12	2,370	3.5
25	30	Andesite, fresh, trace pyrite, blocks, brown matrix	dry, split sample	7.94	2,290	4.8
30	35	Andesite, blocks	dry, split sample	7.84	2,420	4.1
35	40	Andesite and aplite, blocks	dry, split sample	7.96	2,480	5.9
40	45	Andesite, aplite, and rhyolite fragments, trace to minor Pyrite,	dry, split sample	7.97	2,730	4.0
45	50	Andesite and rhyolite fragments, with trace Pyrite	dry, split sample	8.27	2,150	2.3
50	55	Rhyolite, fresh with minor pyrite, and hydrothermally altered volcanics with minor pyrite	dry, split sample	7.58	2,610	2.6
55	60	Andesite, fresh with trace pyrite, and minor hydrothermally altered volcanics with minor pyrite	dry, split sample	6.35	2,450	2.4
60	65	Andesite, with minor pyrite, hydrothermal alteration	dry, split sample	6.01	2,560	4.2
65	70	Andesite, few fragments in a yellow-brown matrix	dry, split sample	4.10	3,510	5.4
70	75	Andesite with minor pyrite, moderate hydrothermal alteration, yellow-brown matrix	dry, split sample	3.90	3,630	5.1
75	80	Andesite, hydrothermal alteration with minor pyrite and aplite, yellow-brown matrix	dry, split sample	3.93	3,760	4.6
80	85	Andesite, hydrothermally altered, with trace pyrite, yellow-brown matrix	dry, split sample	4.41	4,150	4.1
85	90	Andesite, hydrothermally altered, with minor Pyrite, and minor telsic volcanics (rhyolite) with trace chalcopyrite, yellow-brown matrix	dry, split sample	6.59	3,740	3.3
90	95	Andesite, with trace pyrite, minor rhyolite, large fragments, yellow-brown matrix	dry, large fragments	6.35	3,930	4.0
95	100	Mixed volcanics, fresh and hydrothermally altered andesite and rhyolite, yellow-brown matrix	dry, split sample	4.64	3,270	3.8
100	105	Mixed volcanics, andesite and rhyolite yellow-brown matrix	dry, split sample	3.99	3,780	4.5
105	110	Mixed volcanics, fresh and hydrothermally altered andesite with minor rhyolite, yellow-brown matrix	dry, split sample	4.61	3,560	3.6
110	115	Andesite, minor pyrite, slightly altered	dry, split sample	6.73	3,270	2.7
115	120	Andesite, minor pyrite, slightly altered	dry, split sample	5.68	4,090	2.0

Questa Waste Rock Investigation **Physical Properties Log**

Drill Hole: WRD-3
Logged By GM
Date 9/17/99

Interval From	To	Max Particle (inches)	Gravel (%)	Sand (%)	Silt and Clay (%)	Comments
0	5	3/4-1	+/- 50	35	15	-1/2 " gravel
5	10	2	100	0	0	Coarse and angular -2" gravel,. (Sample fines may have been lost)
10	15	1.5	80	15	5	Mostly -1" gravel, durable with few fines
15	20	2				As above
20	25	1.5	70	20	10	As above
25	30	1.5	+/- 50	40	10	-3/4" gravel, slightly plastic fines
30	35	2.5 x 3	60-70	35	10	Coarse -1.5" gravel, durable
35	40	2.5	70	20	10	Mostly -3/4" gravel with plastic fines
40	45	1.5	80	15	5	Coarse and durable -1" gravel , few large fragments, NP fines
45	50	2				As above
50	55	2.5				As above
55	60	2	60	30	10	Decreasing grain size, mostly -3/8" gravel, increasing altered fines
60	65	1/2	60	30	10	As above
65	70	3/4	20-30	50	30	Mostly fine sand and finer, slightly plastic
70	75	>4	55	30	15	-1" gravel in altered fines matrix
75	80	1.5				As above
80	85	2.5				As above
85	90	2	70	20	10	Mostly -3/4" gravel, altered matrix
90	95	1				As above
95	100	1.5	60	25	15	As above
100	105	1	50	30	20	Mostly -1/2" gravel
105	110	2	60	25	15	As above
110	115	2 x 3	75	20	5	More durable gravel, mostly -1", fresher fines
115	120	2	75	20	5	As above

Drill Hole: WRD 4	Driller: Layne Western Drilling
	Equipment: AP-1000 Hammer Drill
Start Date 7/29/99	
End Date	Logged By: A. Eschenbacher, SMA
	G. Muller, SRK Consulting Inc.

Depth From	To	Lithology	Comments	Paste pH (su)	Paste Cond (µS)	Moisture Content (%)
0	5	Mixed volcanics, hydrothermally altered, coarse gravel with tan fines	dry, whole bucket sample	4.17	1,880	5.4
5	10	Dark brown hydrothermally altered volcanics, mostly clay-sand sized	dry, split sample	5.11	2,930	6.3
10	15	Angular gravel (andesite and granite), in a light brown silt-clay matrix,	dry, split sample	7.40	2,400	5.5
15	20	Mixed volcanics, hydrothermally altered, dark brown fines	dry, split sample	7.19	2,720	6.7
20	25	Aplite, granite, and andesite, gravel	dry, split sample	7.87	2,810	4.2
25	30	Mixed volcanics, hydrothermally altered, dark brown matrix	dry, split sample	7.84	2,660	6.4
30	35	Mixed volcanics, light grey gravel, hydrothermally altered, tan matrix	dry, split sample	6.74	2,790	5.6
35	40	Mixed volcanics, light grey, hydrothermally altered	dry, split sample	7.51	2,870	3.9
40	45	Mixed volcanics, grey, coarse blocks,tan matrix	dry, split sample	4.88	3,400	4.9
45	50	Mixed volcanics, grey, coarse blocks,tan matrix	dry, split sample	4.68	3,100	4.5
50	55	Grey volcanics in a tan matrix, gravel <1" dia, slightly moist	slightly moist, split sample	4.85	4,160	6.6
55	60	Grey volcanics, in tan matrix, slightly moist, coarse gravel	slightly moist, split sample	7.78	4,170	4.9
60	65	Andesite, dark, angular, moist, one lithology	split (one lithology)	6.96	3,130	5.4
65	70	Dark grey volcanics,minor andesite, brown matrix, moist	Soil? (one lithology)	7.18	2,810	4.8
70	75	Dark grey volcanics, large angular fragments, slightly moist, brown matrix	moist, more red hue than others	7.95	1,040	3.6

Questa Waste Rock Investigation						Physical Properties Log
		Drill Hole: WRD-4				
		Logged By GM				
		Date 9/16/99				
Interval From	To	Max Particle (inches)	Gravel (%)	Sand (%)	Silt and Clay (%)	Comments
0	5	1-1.5	70-80	+/- 20	+/- 10	Mostly >3/8 inch gravel, moderate weathering/alteration, durable
5	10	1.5				As above
10	15	1-1.5	70-80	+/- 20	+/- 10	Mostly >1/4 inch gravel with minor sand and fines
15	20	1.5	+/- 60	30	+/- 10	Increasing sand and silt, some plasticity
20	25	1.5	70-75	15	+/- 10	Mostly > 1/4" gravel
25	30	3	+/- 60	20-30	+/- 10-20	Mostly gravel, several large fragments
30	35	1	50-60	20-30	15-20	Increasing fines, more weathered/altered
35	40	2	40-50	30	+/- 20	Few large fragments, mostly fine gravel and sand, weatherd/altered
40	45	2.5	50-60	20-30	20	Well graded gravel, mostly fine gravel with sand, weathere/altered.
45	50	3	60	30	+/- 20	Mostly coarse gravel weathered
50	55	1-1.5	50	35	15	Finer gravel finer overall, weathered/altered.
55	60	1-1.5	+/- 60	30	10-15	Coarser, mostly gravel
60	65	2	50	25	25	Mostly gravel in weathered matrix
65	70	1.5	50	25	25	As above

Drill Hole: WRD 5		Driller:	Layne Western Drilling
		Equipment:	AP-1000 Hammer Drill
Start Date	8/1/99		
End Date	8/1/99	Logged By:	A. Eschenbacher, SMA
			G. Muller, SRK Consulting Inc.

Depth From	Depth To	Lithology	Comments	Paste pH (su)	Paste Cond (μS)	Moisture Content (%)
0	5	Andesite and rhyolite, mixed vocanics, yellow-brown matrix	moist	6.18	2,590	6.8
5	10	Rhyolite, minor andesite, brown matrix	moist	7.84	1,880	4.7
10	15	Mixed volcanics with minor aplite, yellow-brown clay rich matrix	moist	4.40	1,650	9.4
15	20	Mixed volcanics, fresh black andesite with trace pyrite and highly altered rhyolite, yellow brown clay rich matrix	moist	3.66	3,000	11.6
20	25	Fresh black andesite with minor pyrite, and highly altered rhyolite (easily crumbled), yellow-brown clay rich matrix	moist	3.80	3,190	6.9
25	30	Dark grey andesite, slightly oxidized with trace pyrite, minor rhyolite, brown matrix	dry	5.11	3,750	6.4
30	35	Black andesite and rhyolitewith trace pyrite, dark grey-brown matrix	dry	7.60	3,770	5.8
35	40	Dark grey-green andesite, large blocks, propylitic alteration, grey matrix	dry	8.02	2,530	4.9
40	45	Dark grey green andesite,propylitic alteration, trace pyrite, calcite, grey matrix	dry	8.03	3,280	4.2
45	50	Dark grey/green andesite, minor pyrite, grey matrix	dry	8.34	3,430	4.3
50	55	Dark grey-green andesite, trace pyrite, calcite present, grey matrix	dry	7.89	3,640	4.5
55	60	Dark grey andesite, brown matrix	dry	7.67	2,530	4.6
60	65	Mixed volcanics, andesite, fresh and altered rhyolite, dark brown matrix	dry	6.52	2,510	6.4
65	70	Mixed volcanics, trace pyrite, large blocks, oxidized, brown matrix	dry	7.73	1,510	7.4
70	75	Dark grey-green andesite, trace pyrite, epidote, with minor rhyolite, grey matrix	dry	8.11	1,050	4.9
75	80	Dark grey andesite, minor pyrite, large blocks, uniform, grey matrix	dry			

Questa Waste Rock Investigation						Physical Properties Log
		Drill Hole:	WRD-5			
		Logged By	GM			
		Date	9/16/99			
Interval From	To	Max Particle (inches)	Gravel (%)	Sand (%)	Silt and Clay (%)	Comments
0	5	1.5	50	30	30	Mostly fine gravel and sand in clayey matrix
5	10	1	50	30	20	Mostly -3/4" gravel, clayey altered matrix with mod plasticity, durable fragments
10	15	3/4-1	+/- 50			Mostly fine gravel and sand in clayey matrix
15	20	1.5	50	30	20	-3/4" gravel in plastic matrix
20	25	1	+/- 70	15	15	Slightly coarser
25	30	1	+/- 70	20	10	-3/4 inch gravel, slightly plastic fines
30	35	1.5	+/- 60	25	15	more durable gravel
35	40	3	70	15	15	Mostly durable gravel with some fines and sand,
40	45	1.5	+/- 50	40	10	Durable gravel
45	50	1.5	40	45	20	-1" gravel in fresh matrix, sandy
50	55	1.5	40	50	10	less gravel, mostly sand
55	60	1.5-2	60-70	20-30	10	Coarse durable fragments
60	65	1	50	30	20	Earthy, -1" gravel, NP fines
65	70	1.5				As above
70	75	3	+/- 70	20	10	Mostly fine gravel and sand, durable
75	80	2	55	30	15	Mostly gravel and sand, durable

Drill Hole: WRD 6		Driller:	Layne Western Drilling
		Equipment:	AP-1000 Hammer Drill
Start Date	8/4/99		
End Date	8/4/99	Logged By:	A. Eschenbacher, SMA
			G. Muller, SRK Consulting Inc.

Depth From	Depth To	Lithology	Comments	Paste pH (su)	Paste Cond (µS)	Moisture Content (%)
0	5	Mixed volcanics, yellow-brown clay rich matrx	moist	3.17	3,130	7.49
5	10	Mixed volcanics,grey tuff dominates, trace pyrite, light brown clay rich matrix	moist	3.29	3,350	7.02
10	15	Mixed volcanics, fresh and highly altered varieties (bleached, oxidized), light brown clay rich matrix	moist	3.53	3,200	10.45
15	20	Mixed volcanics, black andesite,light grey rhyolite/tuff, light brown clay rich matrix, trace pyrite	moist	3.62	2,960	11.25
20	25	Grey rhyolite, with minor highly altered volcanics (rhyolite, trace pyrite) light brown clay rich matrix	moist	3.94	2,970	8.84
25	30	Grey rhyolite, crystal rich (tuff), trace pyrite, grey-brown matrix	moist, drier than above	4.48	2,830	6.20
30	35	Grey crystal tuff, trace pyrite, grey matrix	moist	7.37	2,860	5.66
35	40	Dark grey crystal tuff, strong pyrite, very little banding, grey matrix	moist	7.50	2,430	6.24
40	45	Dark grey crystal tuff, strong pyrite, epidote, grey matrix	slightly moist	7.71	2,850	6.16
45	50	Mixed volcanics, grey tuff, trace pyrite, light grey rhyolite, oxidized rhyolite (?), grey-brown matrix	dry	7.64	3,090	4.66
50	55	Mixed volcanics, dark grey crystal tuff dominates, strong pyrite, grey-brown matrix	dry	7.50	3,410	5.52
55	60	Crystal tuff, light grey, minor pyrite, grey (rock powder) matrix	dry, competent rock-bedrock	7.81	2,980	3.08

Questa Waste Rock Investigation						Physical Properties Log
		Drill Hole: WRD-6				
		Logged By GM				
		Date 9/16/99				
Interval From	To	Max Particle (inches)	Gravel (%)	Sand (%)	Silt and Clay (%)	Comments
0	5	1.5-2	30-40	35	20-25	Mostly -1/2' gravel in altered, high plasticity matrix
5	10	2				As above
10	15	1				As above
15	20	1				As above
20	25	1				As above
25	30	1.5-2	50	35	15	Mostly -1/2" gravel, mod plasticity matrix
30	35	2	50-60	30	15-20	Mostly -3/4 " gravel, altered matrix with mod plasticity
35	40	2				As above, mostly -1"
40	45	1.5				As above
45	50	2 x 3	70	20	10	Coarse gravel, durable and angular
50	55					As above
55	60					As above

Drill Hole: WRD 7	Driller: Layne Western Drilling
	Equipment: AP-1000 Hammer Drill
Start Date 8/1/99	
End Date 8/2/99	Logged By: A. Eschenbacher, SMA
	G. Muller, SRK Consulting Inc.

Depth From	Depth To	Lithology	Comments	Paste pH (su)	Paste Cond (μS)	Moisture Content (%)
0	5	Andesite, trace pyrite, aplite, yellow-brown matrix	dry	5.68	2,450	5.4
5	10	Mixed volcanics, aplite, yellow-brown matrix	dry	3.84	2,570	5.7
10	15	Aplite, mixed volcanics, yellow-brown clayey matrix	moist (raining)	3.63	2,850	7.4
15	20	Mixed volcanics, aplite, yellow-brown matrix	moist (raining)	3.09	3,140	10.4
20	25	Mixed volcanics, aplite, yellow-brown matrix	dry	3.46	3,000	7.2
25	30	Mixed volcanics, dominate andesite, brown matrix	dry	4.52	3,140	4.9
30	35	Mixed volcanics, brown matrix	dry	7.18	3,100	5.2
35	40	Mixed volcanics, rhyolite prophyry dominant, grey-brown matrix	dry	7.57	3,110	6.6
40	45	Mixed volcanics, aplite, grey-brown matrix	moist (lightly raining)	7.57	2,600	6.6
45	50	Mixed volcanics, aplite, brown matrix	dry	7.30	2,200	7.2
50	55	Mixed volcanics, grey rhyolite dominant, grey-brown matrix	dry	7.71	2,250	5.5
55	60	Mixed volcanics, rhyolite dominant, grey matrix	moist	7.43	2,130	7.1
60	65	Grey rhyolite, minor andesite, grey matrix	moist	7.91	1,410	6.4
65	70	Mixed volcanics, rhyolite dominant, grey-brown matrix	moist (lightly raining)	7.63	2,400	5.6
70	75	Light grey rhyolite (partialy oxidized), minor pyrite, with minor black andesite, trace pyrite, yellow-brown matrix	dry	4.28	2,580	4.6
75	80	Andesite porphyry, dark grey, fresh, large blocks	dry bedrock	5.92	2,410	2.9

Questa Waste Rock Investigation						Physical Properties Log
		Drill Hole:	WRD-7			
		Logged By	GM			
		Date	9/16/99			
Interval From	To	Max Particle (inches)	Gravel (%)	Sand (%)	Silt and Clay (%)	Comments
0	5	2	30	40	30	Mostly sand and fines, altered matrix with moderate plasticity
5	10	2-3	60	20	20	Few large fragments in weathered/altered matrix
10	15	1-1.5	60-70	20	10-20	Mostly fine gravel in weathered, clayey matrix
15	20	1.5	50-60	10-30	20-30	Mostly gravel in plastic clay matrix, moist
20	25	3/4	50	30	20	Finer, mostly fine gravel, plastic fines
25	30	1	70	20	10	Increasing gravel, more durable and less weathered/altered
30	35	2	50-60	20-30	10	Mostly -1/2" gravel, less altered
35	40	1/2-3/4	50-60	20	20	Mostly fine gravel and sand, increasing fines, slightly plastic
40	45	3/4	>50	20	10-20	Slightly plastic fines, few large fragments, mostly fine gravel, mod weathering/alt
45	50	3/4-1	+/- 50	30-40	+/- 10	Mostly fine gravel and sand, lower plasticity, mod weathering
50	55	>2 (one)	+/- 60	30	+/- 10-15	Coarse, more durable, mostly fine gravel and sand, less weathered
55	60	3/4-1	+/- 50	+/- 30	15-20	Increasing plastic fines, mostly fine gravel and sand
60	65	1-1.5	+/- 60	+/- 30	10-15	Slightly coarser gravel, plastic fines
65	70	1-2	40	30-35	15-20	More weathered, plastic fines, decreasing gravel content, mostly sand with gravel
70	75	1.5	50-60	+/- 30	10-15	Slightly coarser, gravel weathered.
75	80	3	60	30	10	Mostly coarse and durable gravel, 40% > 1"

Drill Hole: WRD 8	Driller: Layne Western Drilling
	Equipment: AP-1000 Hammer Drill
Start Date 8/3/99	
End Date 8/3/99	Logged By: A. Eschenbacher, SMA
	G. Muller, SRK Consulting Inc.

Depth From	To	Lithology	Comments	Paste pH (su)	Paste Cond (μS)	Moisture Content (%)
0	5	Grey welded tuff, volcanic brecia, dark brown matrix	moist	3.25	2,440	4.7
5	10	Grey tuff, dark brown matrix	moist	3.47	2,480	6.2
10	15	Grey tuff, crystal rich and crystal poor varieties, dark brown clay rich matrix	moist	3.16	2,740	6.4
15	20	Dark grey tuff, trace pyrite, dark brown clay rich matrix	moist	3.23	2,730	6.5
20	25	*Dark grey tuff, minor pyrite, silicified, dark grey-brown matrix*	*moist*	6.17	2,500	5.6
25	30	Grey tuff, minor pyrite, silicified, dark grey-brown clay rich matrix	moist	3.89	2,950	6.7
30	35	Grey tuff, trace pyrite, silicified, dark brown-orange clay rich matrix	moist	3.35	2,620	7.9
35	40	Grey tuff, trace pyrite, crystal rich, brown-orange clay rich matrix	moist	3.07	2,910	8.0
40	45	Grey tuff, trace pyrite, crystal rich, brown-orange clay rich matrix	moist	3.63	2,790	8.5
45	50	Grey tuff, minor pyrite, crystal rich, grey-brown matrix	moist	3.98	2,680	8.5
50	55	Grey tuff, minor pyrite, grey-tan clay rich matrix	moist	3.91	2,570	9.3
55	60	Dark grey tuff, trace pyrite, crystal rich and crystal poor varieties, grey matrix	moist	4.11	2,870	7.3
60	65	Dark grey tuff, trace pyrite, brown clay rich matrix	moist	4.02	2,760	7.8
65	70	Dark grey tuff, crystal poor, light brown clay rich matrix	moist	3.79	3,050	8.7
70	75	Dark grey tuff, trace pyrite, light brown matrix	moist	3.95	3,100	8.7
75	80	Dark grey tuff, trace pyrite, light brown clay rich matrix	moist, drier than above	3.93	3,380	9.4
80	85	Tuff, light grey, fresh, light brown matrix	dry	3.88	3,150	7.4

Questa Waste Rock Investigation						**Physical Properties Log**
		Drill Hole:	WRD-8			
		Logged By	GM			
		Date	9/16/99			
Interval From	To	Max Particle (inches)	Gravel (%)	Sand (%)	Silt and Clay (%)	Comments
0	5	2 x 3	80	15	5	Mostly coarse gravel, weathered/altered matrix
5	10	1	40	45	15	Mostly fine gravel in weathered, altered plastic matrix
10	15	2	50	35	15	As above with more gravel, mostly -3/4" gravel
15	20	1	50	35	15	As above, mostly -3/8" gravel, few larger fragments
20	25	2	60	30	10	Mostly -3/4" gravel
25	30	2	50	35	10-15	Mostly -3/4" gravel in weathered plastic matrix
30	35	1				As above
35	40	1.5				As above
40	45	2.5				As above
45	50	3	60	30	10	-1.5" gravel, high plasticity altered matrix
50	55	1.5	60-65	25-30	15-20	-3/4" gravel, high plasticity altered matrix
55	60	1				As above
60	65	1				As above
65	70	2				As above, coarser - 1" gravel
70	75	2.5				Few larger fragments, -3/4" gravel
75	80	2				As above
80	85	2.5 x 3	70	20	10	Mostly minus 1.5" gravel

Drill Hole: WRD 9		Driller: Layne Western Drilling
		Equipment: AP-1000 Hammer Drill
Start Date	8/2/99	
End Date	8/3/99	Logged By: A. Eschenbacher, SMA
		G. Muller, SRK Consulting Inc.

Depth From	To	Lithology	Comments	Paste pH (su)	Paste Cond (µS)	Moisture Content (%)
0	5	Mixed volcanics, trace pyrite, oxidized clasts, light brown matrix	dry	3.10	2,780	7.3
5	10	Mixed volcanics, brown clay rich matrix	moist	3.79	1,660	9.6
10	15	Mixed volcanics, black andesite dominant, brown clay-rich matrix	moist	3.21	3,480	7.9
15	20	Black andesite, trace pyrite, brown clay rich matrix	moist	3.05	2,910	6.6
20	25	Black andesite, trace pyrite, minor grey rhyolite, brown matrix	moist	3.26	2,250	6.5
25	30	Dark grey welded tuff, brown matrix	dry, poor recovery	4.01	2,550	5.6
30	35	Mixed volcanics, andesite, trace pyrite, rhyolite, tuff, brown matrix	dry, poor recovery	3.23	2,840	5.6
35	40	Grey rhyolite, dark grey welded tuff, light brown matrix	dry, poor recovery	3.41	2,630	6.5
40	45	Rhyolite, light grey, fresh, large blocks, light brown-grey matrix	dry	3.24	1,290	6.1
45	50	Rhyolite, light grey, fresh, large blocks, light brown-grey clay rich matrix	dry	2.89	1,720	6.9
50	55	Grey rhyolite/ welded tuff, light brown clay rich matrix	moist	3.01	3,110	8.7
55	60	Grey welded tuff, light brown clay rich matrix	moist	3.56	4,280	9.8
60	65	Grey welded tuff, minor oxidized tuff with trace pyrite, light brown clay rich matrix	dry	3.67	3,980	6.9
65	70	Grey crystal rich tuff, strong pyrite, brown clay rich matrix	moist	3.57	3,270	8.5
70	75	Grey welded tuff and tuff breccia (boulder +/- 3' dia.), minor pyrite	dry	3.88	3,460	4.3
75	80	Reddish grey tuff, strong pyrite, epidote, large blocks, light brown matrix	dry	4.23	3,660	5.9
80	85	Red-grey tuff, strong pyrite, epidote, large blocks, light brown matrix	dry	6.82	3,530	5.1
85	90	Mixed volcanics, red-grey tuff, strong pyrite, oxidized and bleached crystal tuff, rhyolite (?), dark brown matrix	dry	4.59	3,960	7.3
90	95	Mixed volcanics, mostly red-grey crystal rich tuff, minor pyrite, light brown matrix	dry	3.62	3,810	7.9
95	100	Mixed volcanics, minor pyrite, light brown matrix	dry	3.42	3,330	5.9
100	105	Mixed volcanics, mostly various tuffs, fresh, oxidized, light brown clay rich matrix	dry	3.78	3,450	6.0
105	110	Mixed volcanics, light brown-grey matrix	dry	3.73	4,660	5.6
110	115	Tuff, light grey, crystal rich, (boulder), light brown-grey matrix	dry	3.82	4,630	4.5
115	120	Mixed volcanics, light grey tuff dominant (boulder), grey matrix	dry	3.90	4,940	2.7
120	125	Tuff, light grey, fresh, grey rock powder matrix	dry, bedrock	4.64	2,440	1.3

Questa Waste Rock Investigation — Physical Properties Log

Drill Hole: WRD-9
Logged By: GM
Date: 9/16/99

Interval From	To	Max Particle (inches)	Gravel (%)	Sand (%)	Silt and Clay (%)	Comments
0	5	2-3	50	30	+/- 20	Mostly -1" gravel, plastic fines, weathered/altered
5	10					As above
10	15					As above
15	20	1-1.5	+/- 40	40	+/- 20	Finer, fines plastic, weathered/altered matrix
20	25					As above
25	30	>4	+/- 50	30	20	Few 2-4' fragments, otherwise, as above.
30	35	1.5	+/- 40	30	30	Few fragments >1", mostly fine gravel and sand, weathered/altered, plastic fines
35	40	1				As above
40	45	1.5	50-60	20-30	10-20	-1" gravel, durable fragments, weathered/altered matrix
45	50	1.5-2	40-50	30-40	20-30	Few large fragments, mostly -1" gravel, plastic fines
50	55	1-1.5	+/- 50	30	20	Mostly -3/4" gravel, mod weathering/alteration, NP fines
55	60	2	+/- 50	20	20-25	Mostly -1/2" gravel, few coarse fragments, plastic fines
60	65	4 (one)	60	25	15	-1" gravel, mod weathering/alteration, NP fines
65	70	1.5-2	60	25	15	Mostly -1" gravel with occasional larger fragment, plastic fines
70	75	1.5-2	50-60	20-35	15-20	Well graded gravel with plastic fines, weathered/altered matrix
75	80	2-3				As above
80	85	3				As above
85	90	3				As above
90	95	3	40-55		20-25	As above, finer
95	100	3	40-55		20-25	as above
100	105	4	60-70	+/- 20	+/- 10	Mostly -1" gravel, durable, mod weathering/alteration
105	110	1	30-40	30	30	Pea gravel with high fines content
110	115	3	40-50	30	20	Mostly -3/8" gravel with few large frags
115	120	3 x 5	45	35	20	Durable -1" gravel with one large fragment
120	125	1.5-2	60	30	+/- 10	Coarse -1.5" gravel, durable, nearly fresh

Appendix C

Nova Analyzer Manual

NOVA ANALYTICAL SYSTEMS INC.

INSTRUCTION MANUAL
FOR
NOVA MODEL 309CWP AND 309BCWP
PORTABLE O2 AND CO2
ANALYZER

1925 PINE AVENUE, NIAGARA FALLS, NEW YORK 14301
TEL: (716) 285-0418 (800) 295-3771 FAX: (716) 282-2937
EMAIL: sales@nova-gas.com WEB SITE: www.nova-gas.com

GAS ANALYZER CALIBRATION AND DATA SHEET

MODEL: 309BCWP

SERIAL NO: 5175

P.O. NO.: 69541-9D

DATE SHIPPED: AUG 1799

CUSTOMER: UNOCAL/MOLYCORP INC.

ADDRESS: QUESTA NM

APPLICATION: FLUE GAS ANALYSIS

RANGE(S):
1. READOUT 0-25.0% O2
2. READOUT 0-10.0% CO2
3. READOUT
4. READOUT

OUTPUT(S):
RANGE 1 4-20 MA FOR 0-25% O2
RANGE 2 4-20 MA FOR 0-10% CO2
RANGE 3 FOR
RANGE 4 FOR

ALARM(S):
HIGH SETTING ____ CONTACTS ____ RATING ____ @ ____
LOW SETTING ____ CONTACTS ____ RATING ____ @ ____

SPECIAL ALARM FEATURES:

POWER: 115VAC 60Hz

SAMPLE FLOW RATE: 2 CFH

CALIBRATION: SEE CALIBRATION INSTRUCTIONS

SPECIAL FEATURES:

001058

UNPACKING

Carefully, unpack the analyzer from the shipping carton. If there is a sign of shipping damage, notify NOVA and the shipper.

Keep this instruction book in a secure place and refer to it when there is a question about the analyzer.

OPERATION

This analyzer is designed for the continuous analysis of CO2 and O2 in air by utilizing a sensitive infra-red detector for CO2 and a long life electrochemical sensor for oxygen.

The sample gas drawn into the analyzer, passes through a stainless steel sample tube which has an infra-red emitter and detector at opposite ends. Infra-red energy is radiated through the tube. This infra-red beam is periodically interrupted by pulsing the emitter on and off. An optical filter allows only a certain infra-red wavelength to reach the detector.

Infra-red energy is absorbed in specific wave lengths by certain gases such as CO2. The presence of CO2 in the sample causes less infra-red energy reaching the detector.

A pre-amplifier and processor converts this detector signal to a linear analog output signal which is displayed in units of CO2 on the panel meter. This 0-1V output voltage also appears at the terminal strip at the rear panel of the analyzer. 4-20ma is optionally available.

The Model 309CWP and 309BWP are also supplied with a separate oxygen sensor and digital readout. This is for use in such applications as fruit storage areas or for personnel safety in plants which use CO2 in their process.

A built in sample pump continuously draws in sample through a filter and flowmeter for analysis.

Power is supplied from 115VAC 60Hz or optionally, 220VAC 50Hz on all models. The 309BC will also operate on built in rechargeable gel cell batteries for a period of 9-10 hours before recharging will be necessary. This will be indicated by a red LED light on the front panel. Allow 16 hours for a full recharge of the gel cell batteries.

STARTUP AND USE

Simply turn the analyzer on and allow it to warm up for about 2 minutes, while drawing in room air. (Pump running)

Adjust the oxygen reading to 20.9% with the knob at the side of the cabinet marked 'O2 CAL'.

The CO2 should already be reading zero. If not, press the O2 zero button on the end of the cabinet for two seconds. The reading will automatically set itself to zero.

You are now ready to sample.

Connect a hose to the inlet fitting which would lead to the area to be analyzed. In a few moments, the analyzer will accurately read the O2 and CO2 content of the sample.

CALIBRATION

All 309 analyzers have been calibrated at the factory when shipped, but should be checked again upon first start up with a known CO2 in nitrogen calibration gas.

The O2 calibration should be checked on ambient air at O2.

CO2 should be calibrated on a known CO2 in nitrogen calibration gas mixture.

The calibration gas can also be used to zero the O2.

Allow the analyzer to warm up for about 2 minutes, with the pump running, drawing in ambient air.

O2 CALIBRATION

ZERO and SPAN controls are shown on page 7.

Allow air to flow through the analyzer.

Adjust the 'O2 CAL' knob until the O2 reads 20.9%.

Turn off the sample pump.

The CO_2 in nitrogen calibration gas pressure should be pre-regulated and the flow controlled to a small flow with a needle valve, prior to connection to the analyzer. Allow the cal gas to flow at 2 SCFH as shown on the flowmeter.

If the O_2 does not read zero on the cal gas, adjust the pot marked 'O2 ZERO' on the left side of the top panel (as viewed from the front). (See page 7.)

Again turn on the pump and allow air back into the analyzer.

The readings should return to 20.9% O_2. If not, re-adjust the O2 CAL knob.

CO2 CALIBRATION

First make sure that the CO_2 reading is zero when ambient air is flowing through the analyzer.

The CO_2 requires only a single point calibration on a known CO_2 in nitrogen cal gas.

The CO_2 content should not be less than 50% of full scale range. To obtain the most accurate calibration, the CO_2 content should be between 70-80% of the full scale range by volume i nitrogen.

CO2 SPAN - INITIAL SETUP

The CO_2 detector will have to be 'told' what the CO_2 concentration is in your calibration gas.

To do that, allow the cal gas to flow through the analyzer the same as when calibrating the O_2 detector.

When the reading stabilizes, compare this to the actual CO_2 level in the test gas cylinder. If the CO_2 reading does not agree, press the button marked CO2 SET PT, and at the same time, press CO2 SPAN/DN or CO2 ZERO/UP to shift the reading in the desired direction.

This will only have to be done once as long as the same calibration gas is used. If the gas cylinder is changed, then this procedure should be repeated.

Once the initial setup is done, then if calibrating CO_2 again from the same gas cylinder, simply press the button marked 'CO2 SPAN' for two seconds and the reading will automatically set itself to what you have programmed into it.

MAINTENANCE

No routine maintenance is required on the internal portion of the analyzer. The analyzer is provided with an internal sample filter. Periodically check the condition of this filter and replace when necessary.

RECHARGEABLE BATTERY OPERATED MODELS

These models have a red (RECHG) and green (CHG'G) light in the front panel. When the red light comes on, plug the analyzer into a 115VAC 60Hz (or optionally, a 220VAC 50Hz) power socket with the line cord. The green light will come on to verify that it is charging. Allow the analyzer to recharge for at least 16 hours.

NOTE: No damage will occur to the batteries if it is left on charge for longer than 16 hours. Also, the analyzer can be used even while it is recharging and still be charging the batteries.

OXYGEN SENSOR REPLACEMENT

When the electrochemical oxygen sensor is exhausted, simply remove the small plug in the top of the sensor with needle nose pliers. DO NOT pull on the wires. Unscrew the sensor from its holder.

Reinstall the O_2 sensor in its holder and replace the plug. It is keyed so it will only go in one way.

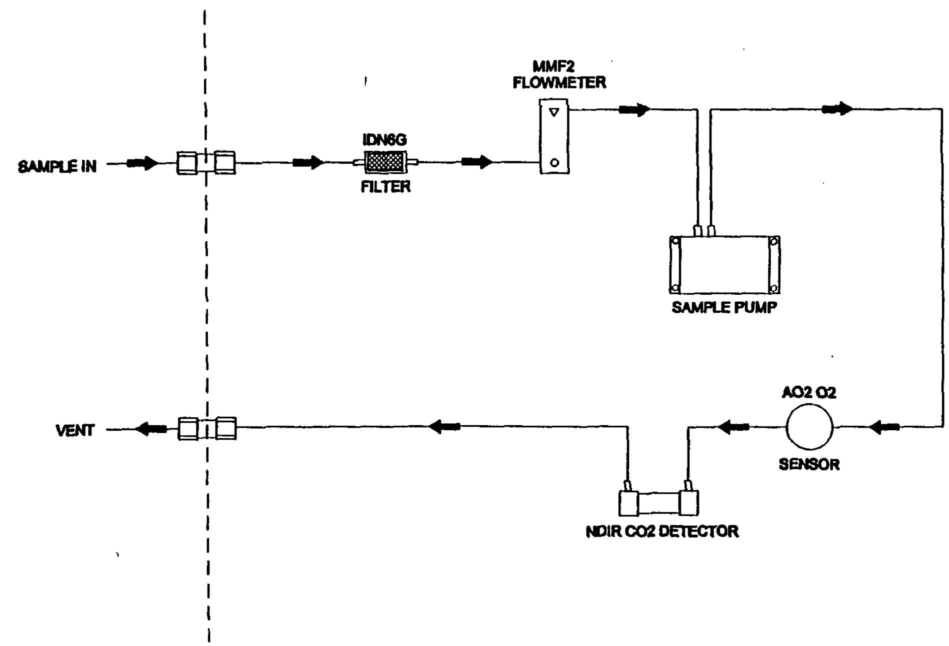
Be careful not to overtighten the sensor. It does not require a lot of pressure against it to seal against its 'O' ring.

Recalibrate the analyzer.

RECOMMENDED SPARE PARTS

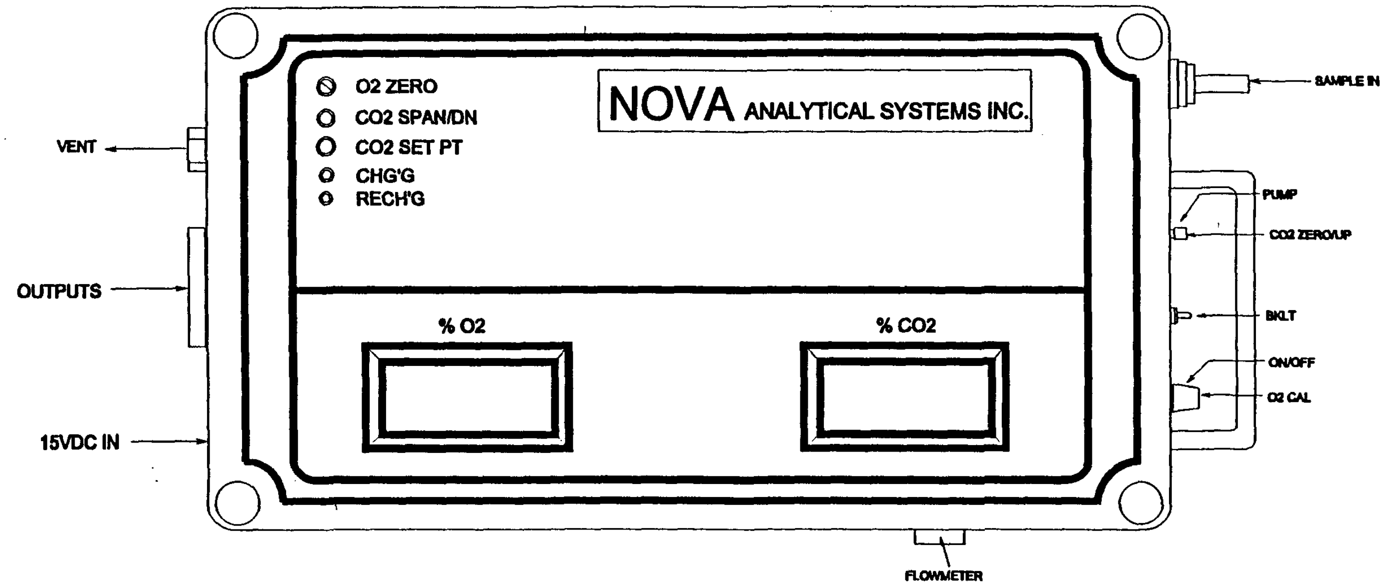
Description	Part No.
External Bowl Filter Element (some models)	309-12-32-50
Internal Filter	309-IDN6G
Sample Pump Model 309B	309-GIL
Sample Pump Model 309 (AC powered)	309-SP3050
Fuse .5A 3AG	
Gel Cell Battery Pack (Model 309B)	309-(2)PS1212
Oxygen Sensor	309-AO2
Digital Readout Meter	309-1760
Power Supply Board	309-TTIII-P.S.
O2 Amplifier Board	309-TTIIIAMP
O2 Output Board - Voltage Output	309-TTIII O/P 0-1V
O2 Output Board 4-20ma Output	309-TTIII O/P 4-20
CO2 Detector Complete	309-V10D

Please include serial number of analyzer when ordering parts.



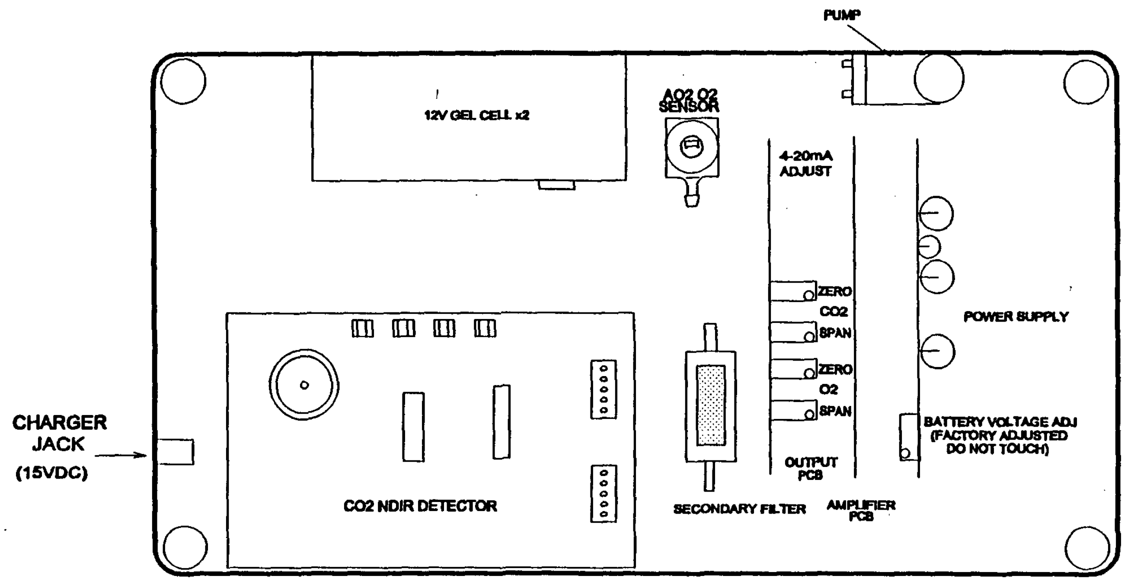
MODEL 309BCWP FLOW DIAGRAM TITLE		
MAY '99 DATE	C REV.	5071-052 DRAWING NUMBER
K.T. DRAWING BY	NOVA Analytical Systems Inc	

001064

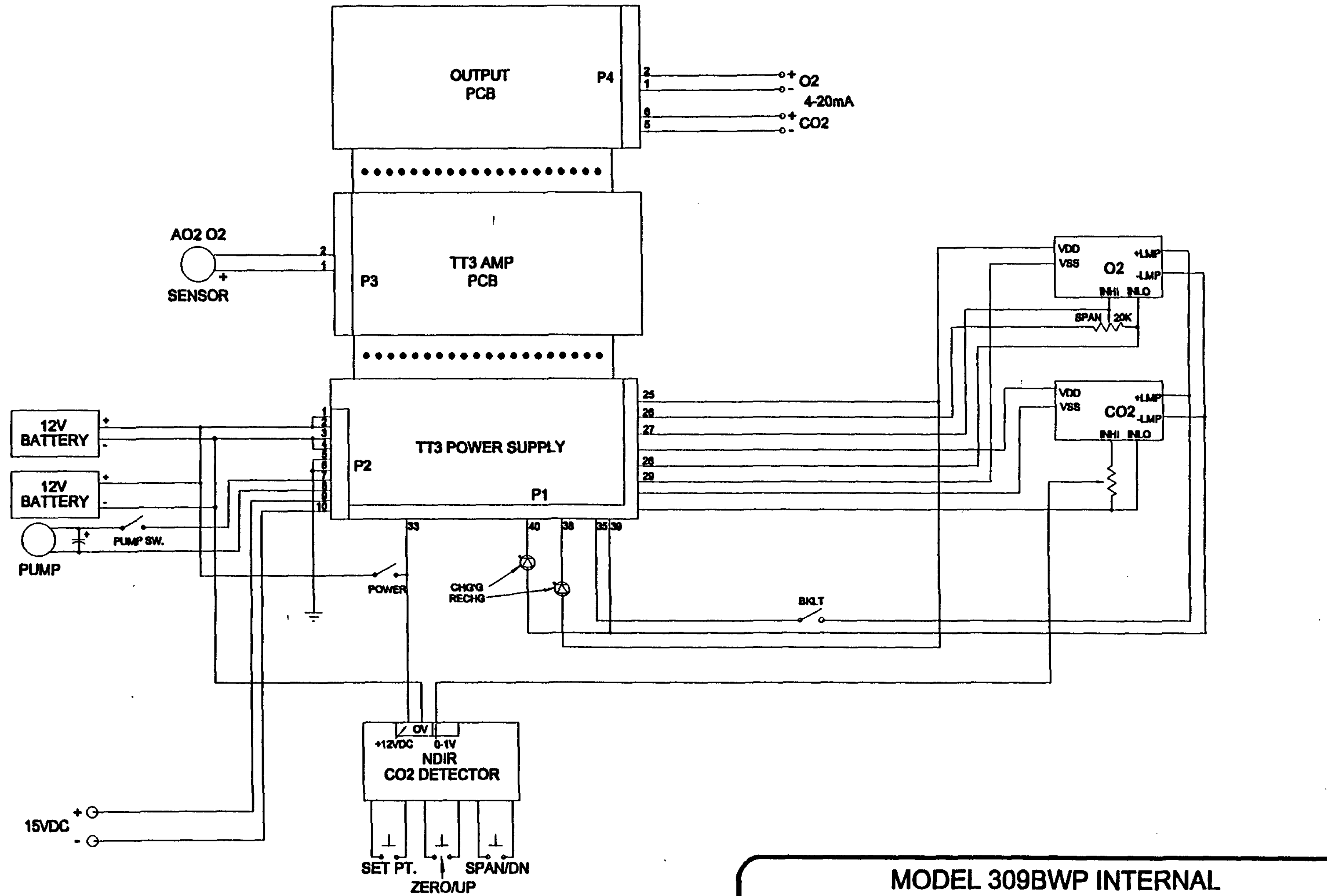


TITLE: MODEL 309BCWP FRONT PANEL LAYOUT DIAGRAM		
DATE: MAY '99	REV.: C	DRAWING NUMBER: 5071-051A
DRAWING BY: K.T.	NOVA Analytical Systems Inc	

001065



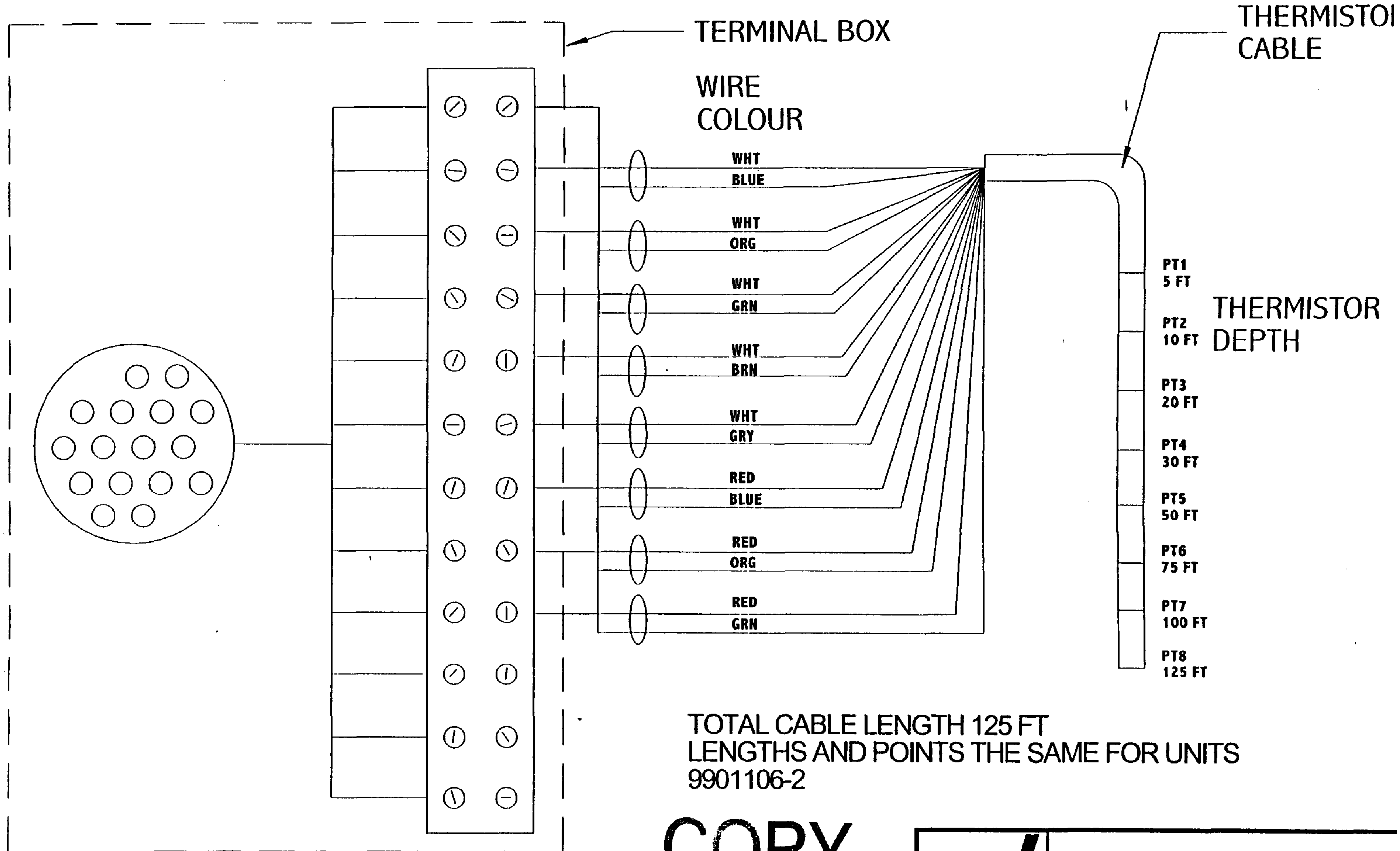
TITLE: MODEL 309BCWP INTERNAL LAYOUT DIAGRAM		
DATE: MAY '99	REV.: C	DRAWING NUMBER: 5071-051B
DRAWING BY: K.T.	NOVA Analytical Systems Inc.	



TITLE
MODEL 309BWP INTERNAL WIRING DIAGRAM

MAY '99 DATE	C REV.	5071-053 DRAWING NUMBER
K.T. DRAWING BY	NOVA Analytical Systems Inc	

001067



TOTAL CABLE LENGTH 125 FT
LENGTHS AND POINTS THE SAME FOR UNITS
9901106-2

COPY
APPROVED

rst INSTRUMENTS

THERMISTOR CABLE

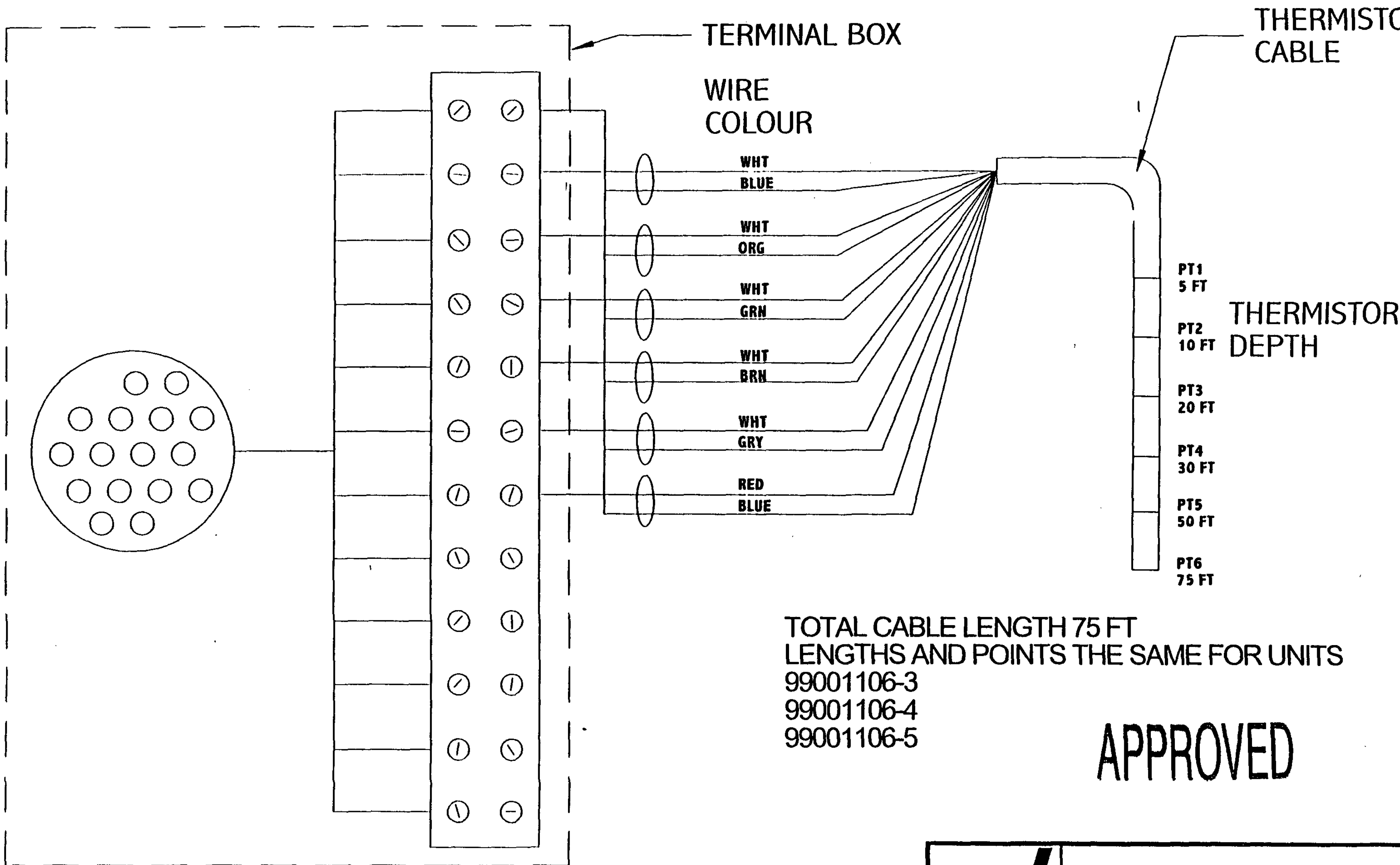
8PT FOR GLOBAL DRILLING

SCALE:	DWG NO:	REV:
1:1	THW0008A	A

DATE: | CHKD: | APPRVD: | DRAWN BY

REVISION TABLE

001068



TOTAL CABLE LENGTH 75 FT
LENGTHS AND POINTS THE SAME FOR UNITS
99001106-3
99001106-4
99001106-5

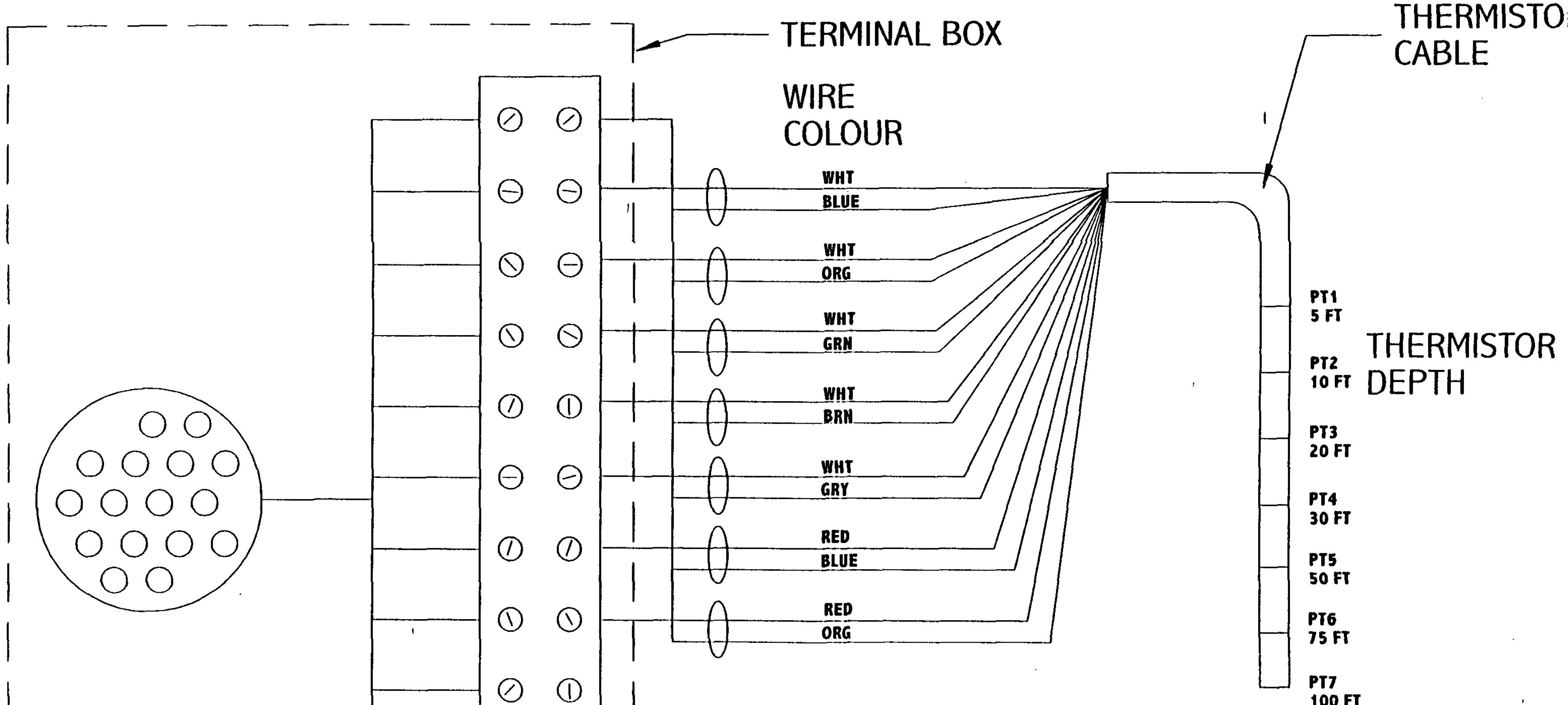
APPROVED

COPY

rst	THERMISTOR CABLE		
	6PT FOR GLOBAL DRILLING		
	SCALE: 1:1	DWG NO.: THW0007A	REV: A
	DATE:	CHKD:	APPROVED:

REVISION TABLE

001069



TOTAL CABLE LENGTH 100 FT
LENGTHS AND POINTS THE SAME FOR UNITS
9901106-6
9901106-7
9901106-8
9901106-9

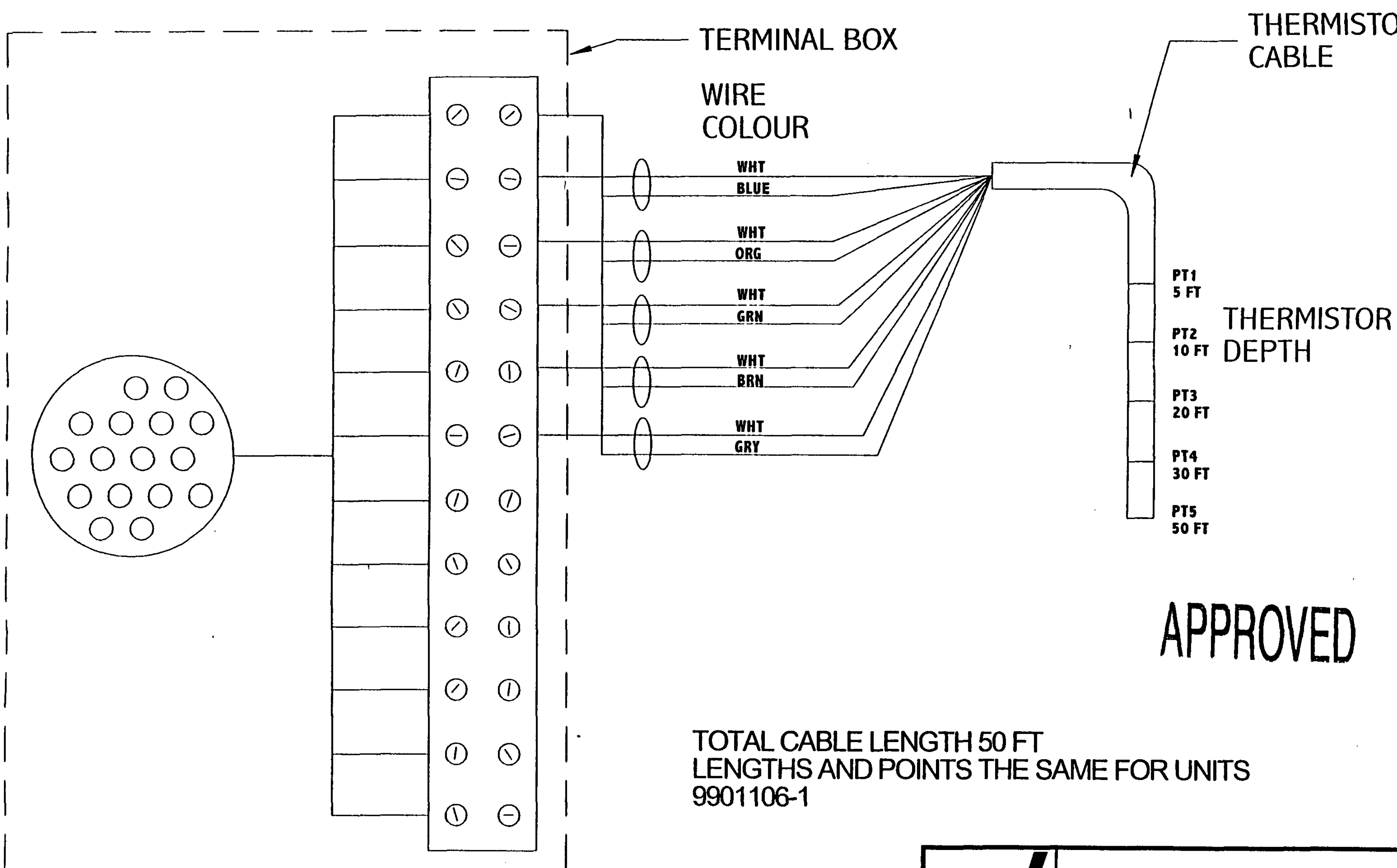
APPROVED

COPY

THERMISTOR CABLE			
7PT FOR GLOBAL DRILLING			
SCALE: 1:1	DWG NO.: THW0010A		REV.: A
DATE:	CHK'D:	APPR'VD:	DRAWN BY

REVISION TABLE

001070



TOTAL CABLE LENGTH 50 FT
LENGTHS AND POINTS THE SAME FOR UNITS
9901106-1

COPY

THERMISTOR CABLE		
5PT FOR GLOBAL DRILLING		
SCALE: 1:1	DWG NO.: THW0009A	REV: A

001071

Appendix D

Thermistor Calibration Data

RST INSTRUMENTS LTD.
200 - 2050 Hartley Avenue, Coquitlam, British Columbia, Canada V3K 6W5

2252ohm
THERMISTOR STRING FUNCTION TEST

CLIENT: Global Drilling
DATE: July 20, 1999

THERMISTOR #	LENGTH	Temperature in °C			
Reference			-19.4	0.4	20.1
9901106-8	5ft	Pt. 1	-19.3	0.5	20.5
	10ft	Pt. 2	-19.3	0.5	20.6
	20ft	Pt. 3	-19.2	0.5	20.5
	30ft	Pt. 4	-19.2	0.6	20.3
	50ft	Pt. 5	-19.4	0.6	20.3
	75ft	Pt. 6	-19.3	0.5	20.3
	100ft	Pt. 7	-19.1	0.7	20.3

Cable length: 100ft

CHECKED BY ____________

Doc:. THL0001A

Tel: (604) 540-1100 Facsimile: (604) 540-1005 Toll Free: 1-800-665-5599 e-mail: info@RST-Inst.com Web Page: www.rst-inst.com

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2252 Ohm @ 25C NTC Thermistor
Steinhart-Hart Linearization

Temp, C	R, Ohms	Calculated T'
-40	75790	-39.991
-35	54660	-34.991
-30	39860	-29.992
-25	29380	-24.996
-20	21870	-19.997
-15	16430	-14.992
-10	12460	-9.991
-5	9534	-4.994
0	7355	0.007
5	5719	5.011
10	4482	10.011
15	3539	15.008
20	2814	20.006
25	2252	25.011
30	1815	30.002
35	1471	35.009
40	1200	40.002

$$T_C = \frac{1}{C_0 + C_1 \ln(R) + C_3 \ln^3(R)} - 273.15$$

where	C_0	0.0014665
	C_1	0.0002385
	C_3	1.006E-07

Resistance versus Temperature Relationship 2252 NTC Thermistors

R ohms	T deg C	R ohms	T deg C	R ohms	T deg C	R ohms	T deg C
76000	-40.04	21500	-19.71	7300	0.15	2800	20.11
75000	-39.84	21000	-19.30	7200	0.42	2750	20.51
74000	-39.64	20500	-18.89	7100	0.69	2700	20.92
73000	-39.43	20000	-18.46	7000	0.97	2650	21.33
72000	-39.23	19500	-18.02	6900	1.26	2600	21.76
71000	-39.01	19000	-17.56	6800	1.54	2550	22.19
70000	-38.80	18500	-17.10	6700	1.84	2500	22.64
69000	-38.58	18000	-16.61	6600	2.14	2450	23.09
68000	-38.36	17500	-16.12	6500	2.44	2400	23.56
67000	-38.13	17000	-15.61	6400	2.75	2350	24.04
66000	-37.90	16500	-15.08	6300	3.06	2300	24.52
65000	-37.67	16000	-14.53	6200	3.38	2250	25.02
64000	-37.43	15800	-14.30	6100	3.71	2200	25.54
63000	-37.19	15600	-14.07	6000	4.04	2150	26.06
62000	-36.95	15400	-13.84	5900	4.38	2100	26.60
61000	-36.70	15200	-13.61	5800	4.72	2050	27.16
60000	-36.44	15000	-13.37	5700	5.07	2000	27.73
59000	-36.18	14800	-13.13	5600	5.43	1950	28.32
58000	-35.92	14600	-12.88	5500	5.79	1900	28.92
57000	-35.65	14400	-12.64	5400	6.17	1880	29.17
56000	-35.37	13900	-12.00	5300	6.55	1860	29.42
55000	-35.09	13400	-11.33	5200	6.94	1840	29.67
54000	-34.81	12900	-10.64	5100	7.33	1820	29.93
53000	-34.52	12400	-9.91	5000	7.74	1800	30.19
52000	-34.22	12200	-9.61	4900	8.16	1780	30.45
51000	-33.92	12000	-9.31	4800	8.58	1760	30.72
50000	-33.60	11800	-9.00	4700	9.02	1740	30.99
49000	-33.29	11600	-8.68	4600	9.46	1720	31.26
48000	-32.96	11400	-8.36	4500	9.92	1700	31.54
47000	-32.63	11200	-8.03	4400	10.39	1680	31.82
46000	-32.29	11000	-7.69	4300	10.87	1660	32.10
45000	-31.94	10800	-7.35	4200	11.36	1640	32.39
44000	-31.58	10600	-7.00	4100	11.87	1620	32.69
43000	-31.22	10400	-6.64	4000	12.39	1600	32.98
42000	-30.84	10200	-6.28	3900	12.93	1580	33.28
41000	-30.45	10000	-5.90	3850	13.20	1560	33.59
40000	-30.06	9800	-5.52	3800	13.48	1540	33.90
39000	-29.65	9600	-5.13	3750	13.76	1520	34.21
38000	-29.23	9400	-4.73	3700	14.05	1500	34.53
37000	-28.80	9200	-4.32	3650	14.34	1480	34.85
36000	-28.35	9000	-3.90	3600	14.63	1460	35.18
35000	-27.89	8800	-3.47	3550	14.93	1440	35.52
34000	-27.42	8700	-3.25	3500	15.24	1420	35.86
33000	-26.93	8600	-3.03	3450	15.55	1400	36.20
32000	-26.42	8500	-2.81	3400	15.86	1380	36.55
31000	-25.89	8400	-2.58	3350	16.18	1360	36.91
30000	-25.35	8300	-2.35	3300	16.51	1340	37.27
29000	-24.79	8200	-2.12	3250	16.84	1320	37.64
28000	-24.20	8100	-1.88	3200	17.18	1300	38.02
27000	-23.59	8000	-1.64	3150	17.52	1280	38.40
26000	-22.95	7900	-1.39	3100	17.87	1260	38.79
25000	-22.29	7800	-1.15	3050	18.23	1240	39.18
24000	-21.60	7700	-0.90	3000	18.59	1220	39.58
23000	-20.87	7600	-0.64	2950	18.96	1200	40.00
22500	-20.49	7500	-0.38	2900	19.33	1180	40.41
22000	-20.11	7400	-0.12	2850	19.72	1160	40.84

RST INSTRUMENTS LTD.
200 - 2050 Hartley Avenue, Coquitlam, British Columbia, Canada V3K 6W5

2252ohm
THERMISTOR STRING FUNCTION TEST

CLIENT: Global Drilling
DATE: July 16, 1999

THERMISTOR #		LENGTH	Temperature in °C			
Reference		·		-19.2	-0.1	19.8
9901106-01		5 ft	Pt. 1	-19.5	-0.1	20.0
		10 ft	Pt. 2	-19.5	-0.2	20.0
		20 ft	Pt. 3	-19.6	-0.2	20.0
		30 ft	Pt. 4	-19.5	-0.3	20.0
		50 ft	Pt. 5	-19.6	-0.1	20.0

Cable length: 50 ft

CHECKED BY ____________________

Doc:. THL0001A

Tel: (604) 540-1100 Facsimile: (604) 540-1005 Toll Free: 1-800-665-5599 e-mail: info@RST-Inst.com Web Page: www.rst-inst.com

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RST INSTRUMENTS LTD.
200 - 2050 Hartley Avenue, Coquitlam, British Columbia, Canada V3K 6W5

2252ohm
THERMISTOR STRING FUNCTION TEST

CLIENT: Global Drilling
DATE: July 16, 1999

THERMISTOR #		LENGTH	Temperature in °C			
Reference				-19.2	0.3	19.8
9901106-2		5 ft	Pt. 1	-19.5	0.3	19.9
		10 ft	Pt. 2	-19.5	0.4	19.8
		20 ft	Pt. 3	-19.4	0.4	19.6
		30 ft	Pt. 4	-19.5	0.3	19.6
		50 ft	Pt. 5	-19.3	0.4	19.9
		75 ft	Pt. 6	-19.6	0.4	20.0
		100 ft	Pt. 7	-19.4	0.2	20.0
		125 ft	Pt. 8	-19.4	0.4	19.9

Cable length: 125 ft

CHECKED BY ______________

Doc:. THL0001A

RST INSTRUMENTS LTD.
200 - 2050 Hartley Avenue, Coquitlam, British Columbia, Canada V3K 6W5

2252ohm
THERMISTOR STRING FUNCTION TEST

CLIENT: Global Drilling
DATE: July 16, 1999

THERMISTOR #		LENGTH	Temperature in °C			
Reference				-19.5	0.3	19.8
9901106-3		5 ft	Pt. 1	-19.5	0.3	20.0
		10 ft	Pt. 2	-19.5	0.3	19.9
		20 ft	Pt. 3	-19.5	0.3	20.0
		30 ft	Pt. 4	-19.4	0.4	20.0
		50 ft	Pt. 5	-19.4	0.4	20.1
		75 ft	Pt. 6	-19.5	0.4	20.1

Cable length: 75 ft

CHECKED BY [signature]

Doc:. THL0001A

RST INSTRUMENTS LTD.
200 - 2050 Hartley Avenue, Coquitlam, British Columbia, Canada V3K 6W5

2252ohm
THERMISTOR STRING FUNCTION TEST

CLIENT: Global Drilling
DATE: July 16, 1999

THERMISTOR #		LENGTH	Temperature in °C			
Reference		·		-19.2	0.3	19.8
9901106-4		5 ft	Pt. 1	-19.4	0.4	19.9
		10 ft	Pt. 2	-19.2	0.4	19.9
		20 ft	Pt. 3	-19.4	0.5	20.1
		30 ft	Pt. 4	-19.4	0.4	20.1
		50 ft	Pt. 5	-19.5	0.4	20.0
		75 ft	Pt. 6	-19.4	0.3	19.8

Cable length: 75 ft

CHECKED BY ________

Doc:. THL0001A

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RST INSTRUMENTS LTD.
200 - 2050 Hartley Avenue, Coquitlam, British Columbia, Canada V3K 6W5

2252ohm
THERMISTOR STRING FUNCTION TEST

CLIENT: Global Drilling
DATE: July 16, 1999

THERMISTOR #		LENGTH	Temperature in °C			
Reference				-19.5	0.5	20.2
9901106-5		5 ft	Pt. 1	-19.6	0.4	20.3
		10 ft	Pt. 2	-19.4	0.5	20.3
		20 ft	Pt. 3	-19.3	0.6	20.3
		30 ft	Pt. 4	-19.3	0.6	20.3
		50 ft	Pt. 5	-19.4	0.5	20.2
		75 ft	Pt. 6	-19.1	0.7	20.3

Cable length: 75 ft

CHECKED BY

Doc:. THL0001A

Tel: (604) 540-1100 Facsimile: (604) 540-1005 Toll Free: 1-800-665-5599 e-mail: info@RST-Inst.com Web Page: www.rst-inst.com

RST INSTRUMENTS LTD.
200 - 2050 Hartley Avenue, Coquitlam, British Columbia, Canada V3K 6W5

2252ohm
THERMISTOR STRING FUNCTION TEST

CLIENT: Global Drilling
DATE: July 16, 1999

THERMISTOR #		LENGTH	Temperature in °C			
Reference				-19.5	0.5	20.2
9901106-6		5 ft	Pt. 1	-19.5	0.4	20.2
		10 ft	Pt. 2	-19.7	0.0	20.1
		20 ft	Pt. 3	-19.3	0.6	20.3
		30 ft	Pt. 4	-19.6	1.4	20.2
		50 ft	Pt. 5	-19.5	0.4	20.3
		75 ft	Pt. 6	-19.6	0.5	20.2
		100 ft	Pt. 7	-19.3	0.4	20.2

Cable length: 100 ft

CHECKED BY ____________

Doc:. THL0001A

Tel: (604) 540-1100 Facsimile: (604) 540-1005 Toll Free: 1-800-665-5599 e-mail: info@RST-Inst.com Web Page: www.rst-inst.com

Recycled

RST INSTRUMENTS LTD.
200 - 2050 Hartley Avenue, Coquitlam, British Columbia, Canada V3K 6W5

2252ohm
THERMISTOR STRING FUNCTION TEST

CLIENT: Global Drilling
DATE: July 16, 1999

THERMISTOR #		LENGTH	Temperature in °C			
Reference		•		-19.5	0.5	20.2
9901106-7		5 ft	Pt. 1	-19.6	0.4	20.2
		10 ft	Pt. 2	-19.6	0.4	20.2
		20 ft	Pt. 3	-19.4	0.6	20.2
		30 ft	Pt. 4	-19.4	0.5	20.2
		50 ft	Pt. 5	-19.6	0.4	20.2
		75 ft	Pt. 6	-19.0	0.8	20.2
		100 ft	Pt. 7	-19.4	0.5	20.2

Cable length: 100 ft

CHECKED BY ____________________

Doc:. THL0001A

RST INSTRUMENTS LTD.
200 - 2050 Hartley Avenue, Coquitlam, British Columbia, Canada V3K 6W5

2252ohm
THERMISTOR STRING FUNCTION TEST

CLIENT: Global Drilling
DATE: July 16, 1999

THERMISTOR #		LENGTH	Temperature in °C			
Reference				-19.5	0.5	20.2
9901106-9		5 ft	Pt. 1	-19.4	0.5	20.4
		10 ft	Pt. 2	-19.4	0.6	20.3
		20 ft	Pt. 3	-19.5	0.5	20.3
		30 ft	Pt. 4	-19.2	0.7	20.3
		50 ft	Pt. 5	-19.5	0.5	20.3
		75 ft	Pt. 6	-19.4	0.6	20.3
		100 ft	Pt. 7	-19.4	0.6	20.3

Cable length: 100 ft

CHECKED BY ____________

Doc:. THL0001A

Tel: (604) 540-1100 Facsimile: (604) 540-1005 Toll Free: 1-800-665-5599 e-mail: info@RST-Inst.com Web Page: www.rst-inst.com

Appendix E

Monitoring Forms

Borehole WRD-1
Questa Waste Rock Investigation
Field Data Collection Form

Sampler		Check for water in casing. Wet/Dry, Depth?	
Date		Water Sampled Yes/No	
Time		Water Sample Identification Number	
Air temperature	C / F		
General Weather Conditions			

Thermistor Data			Pore Gas Data							
Terminal I.D.	Nominal Depth (feet)	Temp (F)	Tube	Tube Location	Nominal Depth (feet)	Tube Evac time (sec)	Oxygen Conc (%)	Carbon Dioxide Conc (%)	Humidity (%)
1	5		1	Top	5				
2	10		2	2nd	10				
3	20		3	3rd	20				
4	30		4	4th	30				
5	50		5	5th	50				
6	75		6	6th	75				
7	100		7	Bottom	100				

Observations

Borehole WRD-2
Questa Waste Rock Investigation
Field Data Collection Form

Sampler		Check for water in casing. Wet/Dry, Depth?	
Date		Water Sampled Yes/No	
Time		Water Sample Identification Number	
Air temperature	C / F		
General Weather Conditions			

Thermistor Data			Pore Gas Data						
Terminal I.D.	Nominal Depth (feet)	Temp (F)	Tube	Tube Location	Nominal Depth (feet)	Tube Evac time (sec)	Oxygen Conc (%)	Carbon Dioxide Conc (%)	Humidity (%)
1	5		1	Top	5				
2	10		2	2nd	10				
3	20		3	3rd	20				
4	30		4	4th	30				
5	50		5	5th	50				
6	75		6	Bottom	75				

Observations

001086

Borehole WRD-3
Questa Waste Rock Investigation
Field Data Collection Form

Sampler		Check for water in casing. Wet/Dry, Depth?	
Date		Water Sampled Yes/No	
Time		Water Sample Identification Number	
Air temperature	C / F		

General Weather Conditions

Thermistor Data			Pore Gas Data						
Terminal I.D.	Nominal Depth (feet)	Temp (F)	Tube	Tube Location	Nominal Depth (feet)	Tube Evac time (sec)	Oxygen Conc (%)	Carbon Dioxide Conc (%)	Humidity (%)
1	5		1	Top	5				
2	10		2	2nd	10				
3	20		3	3rd	20				
4	30		4	4th	30				
5	50		5	5th	50				
6	75		6	6th	75				
7	100		7	Bottom	100				

Observations

Borehole WRD-4
Questa Waste Rock Investigation
Field Data Collection Form

Sampler		Check for water in casing. Wet/Dry, Depth?	
Date		Water Sampled Yes/No	
Time		Water Sample Identification Number	
Air temperature	C / F		
General Weather Conditions			

Thermistor Data			Pore Gas Data						
Terminal I.D.	Nominal Depth (feet)	Temp (F)	Tube	Tube Location	Nominal Depth (feet)	Tube Evac time (sec)	Oxygen Conc (%)	Carbon Dioxide Conc (%)	Humidity (%)
1	5		1	Top	5				
2	10		2	2nd	10				
3	20		3	3rd	20				
4	30		4	4th	30				
5	50		5	Bottom	50				

Observations

001088

Borehole WRD-5
Questa Waste Rock Investigation
Field Data Collection Form

Sampler		Check for water in casing. Wet/Dry, Depth?	
Date		Water Sampled Yes/No	
Time		Water Sample Identification Number	
Air temperature	C / F		
General Weather Conditions			

Thermistor Data			Pore Gas Data						
Terminal I.D.	Nominal Depth (feet)	Temp (F)	Tube	Tube Location	Nominal Depth (feet)	Tube Evac time (sec)	Oxygen Conc (%)	Carbon Dioxide Conc (%)	Humidity (%)
1	5		1	Top	5				
2	10		2	2nd	10				
3	20		3	3rd	20				
4	30		4	4th	30				
5	50		5	5th	50				
6	60		6	6th	75				
7	75		7	Bottom	75				

Observations

Borehole WRD-6

Questa Waste Rock Investigation

Field Data Collection Form

Sampler		Check for water in casing. Wet/Dry, Depth?	
Date		Water Sampled Yes/No	
Time		Water Sample Identification Number	

Air temperature		C / F	
General Weather Conditions			

Thermistor Data			Pore Gas Data							
Terminal I.D.	Nominal Depth (feet)	Temp (F)	Tube	Tube Location	Nominal Depth (feet)	Tube Evac time (sec)	Oxygen Conc (%)	Carbon Dioxide Conc (%)	Humidity (%)
1	5		1	Top	5				
2	10		2	2nd	10				
3	20		3	3rd	20				
4	30		4	4th	30				
5	40		5	5th	50				
6	50		6	6th	60				
7	60		7	Bottom	60				

Observations

Borehole WRD-7
Questa Waste Rock Investigation
Field Data Collection Form

Sampler		Check for water in casing. Wet/Dry, Depth?	
Date		Water Sampled Yes/No	
Time		Water Sample Identification Number	
Air temperature		C / F	
General Weather Conditions			

Thermistor Data			Pore Gas Data						
Terminal I.D.	Nominal Depth (feet)	Temp (F)	Tube	Tube Location	Nominal Depth (feet)	Tube Evac time (sec)	Oxygen Conc (%)	Carbon Dioxide Conc (%)	Humidity (%)
1	5		1	Top	5				
2	10		2	2nd	10				
3	20		3	3rd	20				
4	30		4	4th	30				
5	50		5	5th	50				
6	75		6	Bottom	75				

Observations

Borehole WRD-8
Questa Waste Rock Investigation
Field Data Collection Form

Sampler		Check for water in casing. Wet/Dry, Depth?	
Date		Water Sampled Yes/No	
Time		Water Sample Identification Number	

Air temperature		C / F	
General Weather Conditions			

Thermistor Data			Pore Gas Data						
Terminal I.D.	Nominal Depth (feet)	Temp (F)	Tube	Tube Location	Nominal Depth (feet)	Tube Evac time (sec)	Oxygen Conc (%)	Carbon Dioxide Conc (%)	Humidity (%)
1	5		1	Top	5				
2	10		2	2nd	10				
3	20		3	3rd	20				
4	30		4	4th	30				
5	50		5	5th	50				
6	75		6	Bottom	75				

Observations

Borehole WRD-9
Questa Waste Rock Investigation
Field Data Collection Form

Sampler		Check for water in casing. Wet/Dry, Depth?	
Date		Water Sampled Yes/No	
Time		Water Sample Identification Number	
Air temperature	C / F		
General Weather Conditions			

Thermistor Data			Pore Gas Data						
Terminal I.D.	Nominal Depth (feet)	Temp (F)	Tube	Tube Location	Nominal Depth (feet)	Tube Evac time (sec)	Oxygen Conc (%)	Carbon Dioxide Conc (%)	Humidity (%)
1	5		1	Top	5				
2	10		2	2nd	10				
3	20		3	3rd	20				
4	30		4	4th	30				
5	50		5	5th	50				
6	75		6	6th	75				
7	100		7	7th	100				
8	125		8	Bottom	125				

Observations

001093